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1969(F)
224

THE UNIVERSITY OF ALBERTA

AN EXPERIMENT IN TEACHING CRITICAL THINKING
IN GRADE SIX SOCIAL STUDIES

by



GERALD ALBERT SMALL

A THESIS

SUBMITTED TO THE FACULTY OF GRADUATE STUDIES
IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE DEGREE
OF MASTER OF EDUCATION

DEPARTMENT OF ELEMENTARY EDUCATION

EDMONTON, ALBERTA

FALL, 1969

UNIVERSITY OF ALBERTA
FACULTY OF GRADUATE STUDIES

The undersigned certify that they have read, and recommend to the Faculty of Graduate Studies for acceptance, a thesis entitled AN EXPERIMENT IN TEACHING CRITICAL THINKING IN GRADE SIX SOCIAL STUDIES, submitted by Gerald Albert Small in partial fulfilment of the requirements for the degree of Master of Education.

ABSTRACT

This experiment investigated the results of having teachers use lessons which emphasized the utilization of prepared resource materials according to a model for critical thinking in social studies. The investigator constructed the twenty-four lessons and assembled the resource materials which consisted mainly of slides and a student booklet yielding information on the Indians and Metis of Northern Saskatchewan. For a period of seven weeks four experimental group classes used the resource materials according to the prepared lessons while a control group of four classes followed regular classroom instruction using the same resource materials without the prepared lessons. Eleven hypotheses were postulated concerning the differences between the two groups, relationships between variables, and the differences between boys and girls. These were investigated by means of multiple regression analysis of pre- and post test scores. Subjective evaluations of the lessons were obtained from questionnaires completed by the experimental group teachers.

The Critical Thinking in Social Studies Test and an achievement test were constructed by the investigator and administered along with Part I of the experimental edition of the Cornell Critical Thinking Test, Level X, at the commencement and termination of the experiment. Measures of verbal intelligence were obtained from an administration of the Lorge-Thorndike Intelligence Test, Level 3A during the experiment.

thinking in social studies, and in social studies achievement as these were measured in this experiment.

The general conclusion obtained from the teachers' evaluations of the lessons was that the lessons and the included model for critical thinking were employed with moderate success.

ACKNOWLEDGEMENTS

The writer gratefully acknowledges the contributions of the chairman of his committee, Dr. E. C. Wilson, and the committee members, Dr. M. D. Jenkinson and Dr. V. R. Nyberg. The writer is grateful to other members of the Faculty of Education who provided information or ideas that are incorporated.

Mr. G. Cathcart and Mr. D. Sawada provided advice on the statistics, and the staff of the Division of Educational Research Services assisted in the use of the computer facilities.

Appreciation is expressed to the principals and teachers who co-operated in the several pilot studies preceding the experiment.

The Director of Education and the Superintendent of Elementary Instruction of the Regina Separate Schools kindly gave permission for the experiment to be conducted. The writer is grateful to the principals of the schools involved and to the eight teachers who carried out the instructions that were given and used the prepared materials in their classrooms.

Several people who live or lived in northern Saskatchewan very trustingly loaned their slides to the writer and thereby made the assembling of resource materials possible.

The writer is grateful to Dr. R. H. Ennis who granted permission to use the experimental edition of the Cornell Critical Thinking Test, Form X.

A debt of gratitude is owed to my wife, Doreen, for typing and clerical assistance and for the moral support given during a long year of study.

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CHAPTER I

INTRODUCTION TO THE EXPERIMENT

I. INTRODUCTION

Critical thinking provides a sound basis for making reliable decisions concerning the multifarious options open to citizens in a democracy. In the development of future citizens it is myopic to overlook the learning of critical thinking skills in the subject devoted to preparing children for successful living in society.

Today, the development of critical thinking is recognized as a major goal of American education. Although all areas of the curriculum contribute to achieving this goal, the responsibility of the social studies is a major one, accruing from the very aspects of human endeavor with which the field is concerned. A primary objective of the social studies is to help people think critically about conditions and problems, both personal and social (Starr, 1963, p. 35).

The ability to evaluate inferences and their supporting bases are fundamental skills for the social studies. Students are faced with diverse materials from which they must draw information and develop sound understandings. In the study of man and his social and physical environment the ability to think critically is of great relevance.

Critical thinking . . . undergirds practically all of the other aims of social studies, particularly citizenship, and the determination of one's beliefs and policies about social problems (Burton, Kimball, & Wing, 1960, p. 367).

After reviewing the available research on the teaching of critical thinking, Shaver (1964) concluded that there is some evidence that teachers should specifically teach these skills but added that

"research does not give any firm indication as to the relative effectiveness of various methods of teaching those skills (p. 251)."

A review of more recent literature yielded little research on the teaching of critical thinking in elementary school social studies (Herman, 1969).

II. STATEMENT OF THE PROBLEM

The major problem of this experiment was to determine if critical thinking in social studies could be significantly improved through the utilization of resource materials according to a simplified model applied by regular classroom teachers. In addition, certain relationships and the differences between boys and girls in the abilities being considered were investigated. The problem involved two aspects:

1. the construction of resource materials and lessons suggesting procedures for developing critical thinking skills through the application of a simplified model for critical thinking in social studies.

2. the construction of two tests to measure the effectiveness of the lessons in increasing critical thinking in social studies and the knowledge of facts and understandings.

Resource materials intended to develop understandings concerning the Indian and Metis people of Northern Saskatchewan were incorporated into twenty-four lessons. The lessons focused on the development of critical thinking skills and social studies understandings through the use of stipulated teaching strategies that featured a student model for critical thinking in social studies. The lessons were intended to

complement the topics of the curriculum guide without displacing any part of the regular course of study. The superficial coverage of this topic in textbooks and reference materials discouraged teachers from including it in "Topic Six--Saskatchewan Today" as set out in the Curriculum Guide. The paucity of reference materials on the Indians and Metis of Northern Saskatchewan gave some assurance that the classes of the sample would use mainly the prepared resource materials.

The Division II Curriculum Guide for the Province of Saskatchewan lists the following main aims:

1. . . . to study the relationship between physical surroundings and the lives of people, the interdependence of peoples, the difference between peoples . . .

2. To develop skills . . . in the ability to think critically in drawing conclusions . . .

(Government of Saskatchewan, 1965, p. 170).

The focus in the prepared lessons was to blend these two aims so as to extend and enhance Topic Six and, in addition, to provide guidelines for the development of materials and strategies for teaching critical thinking in social studies.

The incorporation of critical thinking into a study of native culture is justified in the light of the misinformation about sub-cultures that often prevails. To obtain accurate insights and to "understand" people who are "different" requires an ability to evaluate information and to draw valid conclusions. A study of another culture creates an excellent opportunity to foster critical thinking abilities.

III. DEFINITION OF TERMS

Various terms associated with this experiment are understood in

certain ways to satisfy the requirements of the investigation.

Social Studies

Social studies is that part of the curriculum which is concerned with the activities of man as a member of a group. It is concerned with the interrelationships of man in social groups and in his physical environment.

Social Studies Achievement

For the purposes of this experiment social studies achievement is limited in definition to knowledge of facts and understandings as taught by the prepared lessons. It is further limited to that demonstrated on a multiple-choice recognition type test constructed by the writer.

Inferences

An inference is a conclusion that has been derived by reasoning from evidence or premises. In reasoning, the relationships among facts are abstracted and the evidence is weighed and evaluated in coming to a conclusion. Inference "goes beyond what is actually present, and it involves a leap, a jump (Huppé & Kaminsky, 1962, p. 38)."

Critical Thinking

For the purposes of this experiment critical thinking is defined as the ability to carefully evaluate inferences, their supporting premises and evidence, and to cautiously consider all pertinent factors.

Evaluation is essential in critical thinking and is stated or implied in the following definitions:

. . . critical thinking is the process of examining both concrete and verbal materials in the light of related objective evidence, comparing the object or statement with some norm or standard, and concluding or acting upon the judgment then made (Russell, 1956, p. 235).

. . . critical thinking can be identified by three R's: rating, rule, and reason. The critical thinker evaluates what he is thinking about by using implicitly or explicitly certain rules (criteria). These guide his observations and thought. He rates the object of his thought, and justifies his ratings by reasons (Henderson, 1958, p. 152).

Critical thinking . . . involves the organization and unbiased examination of stimuli through comparison with relevant, objective evidence and with norms of conduct and behavior, and the formulation and verification of hypotheses (Black, Christenson, Robinson, & Whitehouse, 1962, p. 152).

For the purposes of this experiment it is deemed necessary to consider critical thinking in social studies in operational terms.

That quoted in Chausow (1965) is considered most pertinent to this end.

After about two years of work, the A. C. C. Committee on Evaluation of Social Studies Objectives, made up of representatives from some fifteen colleges and universities, developed the following operational definition of critical thinking:

1. To identify central issues.
2. To recognize underlying assumptions.
3. To evaluate evidence or authority.
 - 3.1 To recognize stereotypes and cliches.
 - 3.2 To recognize bias and emotional factors in a presentation.
 - 3.3 To distinguish between verifiable and unverifiable data . . .
 - 3.4 To distinguish between the relevant and non-relevant.
 - 3.5 To distinguish between the essential and the incidental.
 - 3.6 To recognize the adequacy of data.
 - 3.7 To determine whether facts support a generalization.
 - 3.8 To draw warranted conclusions.

The drawing of a warranted conclusion involves making an inference. An inference is a truth . . . drawn from . . . a statement which is admitted or supposed to be true; a conclusion; a deduction. An individual needs to realize that certain facts not explicitly stated may be inferred as true or untrue. It is also important to realize the limitations of the inferences which can be made from

given data. Many statements at first glance appear plausible, but if the inferences are properly drawn their meanings may change⁵ (p. 81).

This analysis has been accepted as the operational definition of critical thinking in social studies for this experiment.

For the purposes of measurement critical thinking in social studies is delineated as that measured by the Critical Thinking in Social Studies Test constructed by the writer. Likewise, critical thinking is limited to that measured by the Cornell Critical Thinking Test Level X, Part I.

Resource Materials

In this experiment the term resource materials refers to slides, transparencies, and student booklets which were assembled by the writer. The chief sources of data for the students are the fifty-three slides and fourteen-page student booklets. The student booklets contain paragraphs, charts, and graphs which provide information on the Indian and Metis people of Northern Saskatchewan.

Lessons

In this experiment the term lessons refers to lesson plans, which emphasize the utilization of the resource materials according to a model for critical thinking in social studies. The lesson plans, which consisted of written instructions to the experimental group teachers, were constructed by the writer and set out in teacher guides.

IV. EXPERIMENTAL DESIGN

The experiment was designed to accomplish the purposes set out in the statement of the problem. Resource materials with lesson plans explaining their proper use and two tests were constructed by the

writer prior to commencement of the experiment on May 1, 1969. The duration of the experiment was exactly seven weeks for each class.

Social Studies Resource Materials and Lesson Plans

Resource materials consisting of fifty-three slides, and excerpts from research reports on the Indians and Metis of Northern Saskatchewan were collected. The slides and student booklets containing the excerpts as paragraphs, charts, and graphs were incorporated into twenty-four lessons to teach understandings about this topic. The use of a model for critical thinking in social studies was the prominent feature in each lesson, and the teacher guides gave explicit instructions for the use of the model when presenting the resource materials in the experimental group classrooms. Questionnaires to determine the effectiveness of the lessons in accomplishing their purposes were completed by the experimental group teachers.

The control group teachers received the resource materials but not the prepared lessons. Each was free to use them as he chose although a suggested order of presentation was provided.

Instrumentation

The writer constructed tests to measure critical thinking in social studies and social studies achievement. Critical thinking ability was measured by the Cornell Critical Thinking Test Level X, Part I. These three tests were administered by the writer as pre-tests with the teacher absent from the room and as post-tests exactly seven weeks later at the same time of day and day of the week as the pre-tests.

The Lorge-Thorndike Intelligence Tests, Level 3, Form A, re-usable edition, were administered by the writer to all members of the sample shortly after the pre-tests.

All tests were used with separate answer sheets that were scored on the IBM 1230.

Sample

A sample of eight classes was randomly selected from a population of all grade six classes in the Graton Roman Catholic Separate School District Number 13, of Regina, Saskatchewan. Four of these were randomly assigned to the experimental group and the remaining four were the control group. Each of the selected classes was from a different school except for two control group classes. Having been a teacher in Regina for several years the writer surmised from the location of the schools containing the selected classes that both groups would contain subjects from low to high socio-economic levels. It appeared most likely that the subjects would not be concentrated at one ability level.

V. HYPOTHESES

In order to answer questions concerning the effectiveness of teaching critical thinking in social studies, the differences between boys and girls, and the relationships between variables, the following hypotheses were formulated. They are expressed in the null form.

1. There is no significant difference between the experimental group and the control group in the development of critical thinking in social studies.

2. There is no significant difference between the experimental group and the control group in the development of critical thinking.

3. There is no significant difference between the experimental group and the control group in social studies achievement.

4. There is no significant relationship between gains in critical thinking in social studies and intelligence quotient (IQ) in the experimental group or in the control group.

5. There is no significant relationship between gains in critical thinking and IQ in the experimental group or in the control group.

6. There is no significant relationship between gains in social studies achievement and IQ in the experimental group or in the control group.

7. When adjustments have been made for IQ, there is no significant relationship between social studies achievement and the development of critical thinking in social studies in the experimental group or in the control group.

8. When adjustments have been made for IQ, there is no significant relationship between social studies achievement and the development of critical thinking in the experimental group or in the control group.

9. There is no significant difference between boys and girls in the development of critical thinking in social studies in the experimental group or in the control group.

10. There is no significant difference between boys and girls in the development of critical thinking in the experimental group or in the control group.

11. There is no significant difference between boys and girls in social studies achievement in the experimental group or in the control group.

VI. ASSUMPTIONS MADE IN THE EXPERIMENT

In order to proceed with the experiment and to interpret and draw conclusions from the resulting data, it was necessary to proceed on the following assumptions:

1. The teachers of the experimental group did follow the explicit directions in the guides and were sufficiently oriented toward the use of the suggested strategies for their successful deployment.

2. The control group teachers did not stress the teaching of critical thinking in social studies either due to their usual classroom methods or due to accidental contacts with the teachers of the experimental group.

3. The tests constructed by the writer and the Cornell Critical Thinking Test were precise enough to accurately measure the abilities, as designed, and that the abilities the tests purported to measure can be measured by paper and pencil tests.

4. The teachers chosen randomly with their classes were closely enough matched in classroom performance so as to not adversely affect comparisons between groups.

5. The random selection of classes and their placement in groups provided two groups that were similar enough to make comparisons.

6. The specified treatment caused the differences, if any, that were detected.

VII. LIMITATIONS OF THE EXPERIMENT

The writer recognized the following limitations in the conduct of the research:

1. The duration of the experiment, seven weeks, is a minimal time for the significant advancement of critical thinking skills. The termination of the school year in June prevented any extension of the experiment.

2. No effort was made to determine or to control the teaching strategies employed in the control group. Some of these teachers may have employed strategies to teach critical thinking in social studies.

3. Four experimental and four control classes were used. The cost of the prepared resource materials was an obstacle in the selection of a larger sample.

4. Variables other than the planned teaching strategies may have operated in determining the results. For example, the resource materials used by the control groups may in themselves stimulate critical thinking.

5. Reading may account for a substantial amount of the variability on the critical thinking tests but no effort was made to control for this.

6. There was no control on the amount of other resource materials that were brought into the classrooms or on the children's use of these materials.

VIII. SIGNIFICANCE OF THE EXPERIMENT

There is little research on the teaching of critical thinking in social studies in the elementary grades although this skill is

included in social studies objectives. Lessons that are effective in teaching critical thinking in social studies, while maintaining content achievement, could serve as a model to stimulate curriculum development. Since audio-visual materials and libraries with resource materials are becoming more readily available, findings on an effective method of using resource materials could stimulate their more efficacious presentation in classrooms. If judged effective, the teaching strategies centering on the model for critical thinking could be advocated for more widespread use. The research information on the use of a model for critical thinking could indicate the advisability of providing teachers with written suggestions for its application in elementary school social studies. The critical thinking in social studies test could serve as a classroom tool for measuring the results of instruction or it could serve as a model for teacher-made tests.

CHAPTER II

REVIEW OF THE LITERATURE

I. INTRODUCTION:

The literature on research related to critical thinking extends over such a broad range of theoretical perspectives that no attempt was made to review all of it. Priority was given to research on critical thinking that featured methods of improving it, instruments of evaluation, and its relationship to other intellectual factors. A review of background literature on the term critical thinking is included to elucidate the concept as it is generally considered and to manifest some of the basic sub-processes.

The application of principles of logic is essential for making valid inferences in critical thinking (Ennis & Paulus, 1965). A few studies investigated the direct teaching of the rules of logic as an aspect of critical thinking. On the other hand, other investigators assumed that the application of these principles would come about indirectly through an emphasized practice of the critical thinking skills. Research using the latter approach was considered more relevant to developing critical thinking in social studies and its findings were reviewed in greater detail.

The development of critical thinking skills received foremost consideration in the studies of reflective thinking and inquiry in social studies. Several of these studies created and evaluated models to guide and analyze classroom strategies emphasizing the practice of

critical thinking skills. The findings of these investigations are most pertinent to the present experiment and lend support to its design for teaching critical thinking in social studies.

II. BACKGROUND TO CRITICAL THINKING

Inference

This process is fundamental in critical thinking and has been analyzed by writers on logic as deductive and inductive reasoning. The principles that have been developed to evaluate the products of thinking are distinct from theories on how the mind arrives at these products. "Formal traditional logic is the science of valid inference as distinguished from systematic psychological study of how the mind works (Burton, Kimball, & Wing, 1960, p. 25)." Nonetheless, both contribute necessary understandings to guide the selection of instructional procedures for development of this ability.

The field of logic has yielded basic insights into critical thinking. The need for a critical thinker to effectively apply the rules of logic was posited as a guiding principle in the research by Hyram (1957). It was stated that " . . . thinking is critical when it is essentially logical (p. 125)." Ennis has developed and refined a list of abilities that characterize the critical thinker. According to his analysis, "Deductive logic . . . is a central part of critical thinking . . . (Ennis & Paulus, 1965, p. II-2)."

The Concept of Critical Thinking

In presenting the concept of critical thinking Ennis (1962) listed twelve aspects:

1. Grasping the meaning of a statement.

2. Judging whether there is ambiguity in a line of reasoning.
3. Judging whether certain statements contradict each other.
4. Judging whether a conclusion follows necessarily.
5. Judging whether a statement is specific enough.
6. Judging whether a statement is actually the application of a certain principle.
7. Judging whether an observation statement is reliable.
8. Judging whether an inductive conclusion is warranted.
9. Judging whether the problem has been identified.
10. Judging whether something is an assumption.
11. Judging whether a definition is adequate.
12. Judging whether a statement made by an alleged authority is acceptable. (p. 84).

Ennis (1962) also listed three dimensions of critical thinking:

The logical dimension, roughly speaking, covers judging alleged relationships between meanings of words and statements.

The criterial dimension covers knowledge for judging statements . . . except for the logical criteria, which are covered by the logical dimension.

The pragmatic dimension covers the impression of the background purpose on the judgment, and it covers the decision as to whether the statement is good enough for the purpose (p. 84).

Criticism of the "General-aspects" View

Berlak (1965) argued that the "general-aspects" view as widely accepted by educators and represented in Ennis (1962) is prone to the problem of extreme generality. He noted that there appears to be a common assumption that the steps, operations, or aspects named in critical thinking, reflective thinking, and problem-solving are not content specific but can be applied to any problem or issue facing the learner. Berlak summarized his argument as follows:

It was shown that the "problem areas" in which a person may use his intellectual abilities are exceedingly diverse--so diverse that the use of generalized strategies or aspects is of questionable value. The use of general steps assumes a knowledge about the thinking process that is simply not available. In addition, while the general lists do use words which are more or less common to inquiry in many areas, for example, hypothesis-testing, assumptions, inference, etc., it is somewhat doubtful that these labels refer to the same set of explicit steps in various domains (p. 8).

Pursuing his argument in a more constructive vein Berlak added that:

What I am suggesting is that educators rely less on the inadequate general models and focus on studying intellectual process in a given area in order to develop output criteria and models that appear to characterize successful output for that area. From these context-specific models and criteria, educators may develop pedagogical strategies and teaching material that are appropriate for that area (p. 9).

It appears that one must be cautious in expecting results in a subject area from the use of a general model of critical thinking. Perhaps models of critical thinking constructed in a specific content area would prove to be more effective.

Critical Thinking and Other Intellectual Processes

The substantial congruence between critical thinking and thinking hinders attempts to theoretically separate the two processes. Russell (1956) positioned critical thinking between problem-solving and creative thinking in his hierarchy of thinking processes but added that it was also part of both. Burton, Kimball, & Wing (1960) presented the following as a definition of thinking acceptable to them.

Thinking results when there is persistent effort to examine the evidence which supports any belief, solution, or conclusion which is suggested for acceptance, together with the implications and further conclusions of the evidence (p. v).

Further on, Burton et al considered thinking to be "the critical, selective search for valid conclusions which solve our problems, resolve our doubts, and enable us to choose between conflicting

statements of doctrine or policy (p. 18)." Burton et al reserved the term critical analysis for "the special procedure of analyzing some other person's attempt to solve a problem (p. 18)." Critical thinking occurs when the process of thinking as applied to the solution of a problem is analyzed and evaluated against certain norms or standards.

Huppé and Kaminsky (1962) described a thought cycle that began with observation to determine more definitely and precisely the nature of the difficulty and ended with observation to test the value of some hypothetically entertained conclusion. In between they placed the following more distinctively mental aspects of the thought cycle:

(I) inference; the suggestion of an exploration or solution; and (II) reasoning, the development of the bearings and implication of the suggestion. Reasoning requires some experimental observation to confirm it, while experiment can be economically and fruitfully conducted only on the basis of an idea that has been tentatively developed by reasoning (p. 40).

When discussing critical thinking they state that:

The essence of critical thinking is suspended judgment; and the essence of this suspense is inquiry to determine the nature of the problem before proceeding to attempts at its solution. This, more than any other thing, transforms mere inference into tested inference, suggested conclusions into proof (p. 38).

Using the methods of factor analysis Guilford brought to light some sixty different abilities that were involved in intellectual activity. In his five classes of abilities, which were called Operations, the fifth is of significance:

A fifth group has to do with evaluation, which, in more familiar ways of speaking, means critical thinking. We continually evaluate what we know, what we recall, and what we produce by way of conclusions (1960, p. 177).

In his structure of the intellect evaluation was considered to be one of the major types of thinking along with divergent and

convergent production. The semantic column of the evaluative or critical thinking area contained most of the basic abilities that were known. Guilford added: "The evaluation of semantic conclusions where relationships are concerned rather clearly involves the standard of logical consistency (1960, p. 182)."

Russell (1956) very aptly called critical thinking an "omnibus term" because it included such a variety of activities and had so many meanings. When reviewing research on the processes in thinking Russell (1965) summarized the many interpretations of critical thinking as follows:

It has been made synonymous with the ability to abstract and organize information, to draw inferences, to search for relevant materials, to evaluate data, to compare sources, to employ a from-Missouri attitude, to distinguish fact from opinion, to detect propaganda, and to apply the rules of logical reasoning (p. 14).

A description of critical thinking included the words "evaluating" and "judging". Russell included the process of critical thinking in intellectual functioning as follows:

Usually . . . part of some other process as in evaluating the kinds of evidence collected in problem solving or judging the original result in creative thinking. The nearest the psychologist comes to allowing the term is in his use of the word judgment (1965, p. 13)

Glaser (1941) considered critical thinking to have three aspects:

(1) an attitude of being disposed to consider in a thoughtful way the problems and subjects that come within the range of one's experiences, (2) knowledge of the methods of logical inquiry and reasoning, and (3) some skill in applying those methods (p. 5).

Glaser added the following elaboration to the above definition:

Critical thinking calls for a persistent effort to examine any belief or supposed form of knowledge in the light of the evidence that supports it and the further conclusions to which it tends. It generally requires ability to recognize problems, to find workable means for meeting those problems, to gather and marshal pertinent information, to recognize unstated assumptions and values, to

comprehend and use language with accuracy, clarity, and discrimination, to interpret data, to appraise evidence and evaluate arguments, to recognize the existence (or non-existence) of logical relationships between propositions, to draw warranted conclusions and generalizations at which one arrives, to reconstruct one's patterns of beliefs on the basis of wider experience, and to render accurate judgments about specific things and qualities in everyday life (p. 5).

Summary

Critical thinking incorporates a variety of abilities and as such overlaps other cognitive processes. Evaluation and the mental propensity to judge with severity according to norms or standards are central to the process. The broad theoretical perspective of critical thinking requires careful translation into operational terms in order to foster and measure its development.

III. LITERATURE ON CHILDREN'S ABILITY TO LEARN LOGIC

Introduction

Ennis & Paulus (1965) considered logic to be an important part of critical thinking and stated: "It is that part of critical thinking which deals with whether a conclusion follows necessarily from the premises that are offered in support of it (p. VIII-3)." Research findings on learning and applying the rules of logic contributed deeper insights into critical thinking.

In Junior High School

Hiram (1956 and 1957) instructed pupils in grades seven and eight using a "Socratic Method" of "carefully phrased questions based on simple problems (1957, p. 127)" to lead them to discover for themselves and express the rules of logic. Two of his several assumptions, posited as guiding principles for the selection of

content and development of teaching methods, were that "thinking is critical when it is essentially logical (1957, p. 125)" and "an individual's growth in the ability to do logical thinking must depend upon his acquiring a working knowledge of the basic rules of logic (1957, p. 125)." The students in the experimental group who were instructed in the rules of logic made significantly greater gains than the matched control group on a test primarily concerned with the application of rules of logic. The Test of General Reasoning Ability that was constructed for the experiment consisted of several sub-tests, such as: Grasping Implications; Finding Errors in Thinking; Grasping Implications of Hypothetical Situations; Discovering Hidden Assumptions; Discovering Rules; Building a Theory; Making Generalizations; Making Analogies; and Identifying Errors in Thinking.

In his doctoral dissertation Hiram (1956) reported a correlation of .54 between mental ages and initial reasoning abilities (General Reasoning Ability pre-test). Hiram explained the correlation as follows:

Now, such a significant correlation between mental age and initial reasoning ability of the combined groups represented almost natural maturation without benefit of direct or concentrated learning experiences in logical thinking (1956, p. 198).

When he found that the correlation between mental age and final reasoning (General Reasoning Ability post-test) was .146 and not statistically significant, he concluded that "the factor of mental age alone is not sufficient to bring about desirable gains in the power to do logical thinking (1956, p. 200)."

In Lower Elementary Grades

In an investigation involving children aged six, seven, and eight, Hill (1960) defined and limited "logical reasoning" to the ability to

derive correct conclusions from sets of given premises. Inferred conclusions were considered valid and correct when they conformed to the tenets of "modern logic". It was assumed that the relations dealt with in formal logic are commonly accepted modes of correct thinking and that "growth in logically correct thinking is the result of the acquisition, whether consciously or unconsciously, of the basic principles of logical theory (p. 6)." The test that was constructed and used by Hill did not test for any fallacies. The results as interpreted by Hill are encouraging for endeavors to develop children's abilities to make sound inferences in elementary school.

The conclusion of this study is, therefore, that children of ages six through eight are able, with a high degree of success, to recognize valid conclusions determined by formal logical principles. This relationship between the results of children's thinking in a given situation and the principles of formal logical theory is basic to this study. We may infer that children from six to eight years of age have acquired or make use of certain principles of inference, not in the sense that they know principles as principles, or can verbalize them, but in the sense that they behave in drawing conclusions in accordance with the criteria of validity of formal logic (Hill, 1960, p. 71).

Cornell Critical Thinking Project, Phase I

In reporting the first phase of the Cornell Critical Thinking Readiness Project, Ennis & Paulus (1965) stated that the primary goals in the project were "to contribute to knowledge about what critical thinking is and to knowledge about when it can be taught (p. I-1)." The first phase was concerned with deductive logic and adolescents aged ten to eighteen. The study used 803 subjects and at each grade level one class-size group was instructed in logic. Conditional logic was tested for and taught at grades five, seven, nine, and eleven, while class logic was tested for and taught at grades four, six, eight, ten,

and twelve. The Cornell Conditional-Reasoning Test, Form X, and the Cornell Class-Reasoning Test, Form X, were constructed for the purpose of determining whether principles of logic were mastered and the degree to which they were mastered.

Ennis & Paulus (1965) found statistically significant correlations of .58 and .68 between age and logic mastery as measured by the tests on class logic and conditional logic. The mean correlations between (Lorge-Thorndike) IQ and the tests in class logic and conditional logic were .58 and .52 and statistically significant. There appeared to be no relationship between mastery of logic and sex. Ennis & Paulus considered several questions concerning the natural-cultural development of knowledge of conditional and class logic of students ages ten to eighteen who have not been exposed to instruction in deductive logic. The results indicated that:

The basic principles of conditional reasoning are not generally mastered by age 11-12, nor by age 17.

The basic principles of class reasoning are not generally mastered by age 11-12, nor are they fully mastered by age 17.

The principles expressing the basic logical fallacies are the most difficult at ages 10-12.

Class reasoning appears to be easier than conditional reasoning at all levels (p. V-43).

After considering "what children can come to know" and not what they already know it was reported that:

There was practically no learning of conditional reasoning in grades 5, 7, and 9; but in grade 11 there was a vast improvement.

For class reasoning on the other hand there were small amounts of improvement from grade 6 onward, the largest improvement under instruction being registered with the most complex items (p. VI-39).

Summary

The studies on children's facility to apply the rules of logic yielded some insight into their ability to make sound inferences, a fundamental ability in critical thinking. A review of the literature indicated that children in elementary school can intuitively use principles of correct inference in deducing conclusions from premises but that the "mastery" of the principles of deductive logic as set out by Ennis & Paulus (1965) is not generally achieved. Elementary school children are capable of making valid inferences although this ability is only partially developed at that age level. Whether or not this ability would be enhanced when used in the context of a specific content field was not considered in the studies on logic.

IV. LITERATURE ON CRITICAL THINKING

Introduction

Several studies on critical thinking were reviewed to determine the skills involved and what research has shown to be successful strategies for developing critical thinking. Procedures for measuring critical thinking ability and the correlations with other factors were noted. The studies considered here investigated critical thinking in the context of a particular subject matter content.

Teaching Critical Thinking in High School English

Glaser (1941) investigated the development of critical thinking ability in grade twelve English. The teachers of the four experimental classes used lesson plans prepared by the investigator while the four classes of the control group followed the regular English program. The series of lesson plans were divided into eight units with the following

titles: (1) Recognition of Need for Definition, (2) Logic and Weight of Evidence, (3) The Nature of Probable Inference, (4) Deductive and Inductive Inference, (5) Logic and the Method of Science and Some Characteristics of Scientific Attitude, (6) Prejudice as a Factor Making for Crooked Thinking, (7) Values and Logic, and (8) Propaganda and Crooked Thinking (pp. 95-101).

The Watson-Glaser Tests of Critical Thinking were administered before and after the experiment to both experimental and control groups. There was a group trend for the more intelligent students to profit most from training in critical thinking. The correlation between scores made on the Otis intelligence test and the Watson-Glaser Tests of Critical Thinking was found to be .46. Age, sex, average previous school marks, home background rating, and scores on the Interest-Values Inventory were not related to high and low gains in critical thinking. Intelligence, reading ability, and school marks were most closely related to scores made on the critical thinking tests. Retest scores and observable behavior indicated that the growth in ability to think critically was retained for at least six months after conclusion of the special instruction. Glaser pointed out that the students who made significant gains in critical thinking ability were not necessarily more competent to render critical judgments in other fields. A major finding of the research was that improvements in critical thinking can be stimulated by lessons developed for this purpose.

Teaching Critical Thinking in Elementary School

Maw (1959) undertook an experiment to determine whether the critical thinking ability of fourth, fifth, and sixth grade children could be improved by the use of prepared exercises. The twenty-four

lessons were designed to give practice in the use of selected critical thinking skills. Directions to the teachers specified classroom procedures for the exercises and were definite enough to obtain a measure of uniformity of instruction in the experimental classes.

Each lesson was designed to develop one or more of the following critical thinking skills:

- (1) selecting relevant facts, (2) judging the reliability of data, (3) making generalizations and inferences, (4) recognizing situations in which evidence is insufficient for a conclusion, (5) determining cause and effect, and (6) evaluating arguments (p. 25).

The content used in the exercises was related to several school subjects with that from science predominating. Only a couple of the exercises used content related to social studies. No attention was given to learning the content of the exercises. A simplified version of Skinner's formal statement of the problem-solving process was used with the children. It was realized that the process was not a perfect or smooth sequence of steps in the actual classroom situation. The simplified version consisted of the following steps:

Stating the problem exactly

Finding out about it

Thinking of possible reasons or answers

Trying them out

Testing the one chosen

Stating the answer (p. 77).

The "Suggestions to the Teacher" stipulated how the problem-solving approach was to be used in directing class discussion.

The Davis-Eells Test of General Intelligence or Problem-Solving Ability and the Test of Critical Thinking constructed by the investigator

were administered as pre-tests and as post-tests. The Test of Critical Thinking contained seventy-one items in three sections: Inference, Deduction, and Interpretation. After instruction for eight weeks the experimental group of twenty-one classes made mean gains on both tests that exceeded those of an equal number of control group classes. The difference shown on the Davis-Eells test was not significant whereas that shown on the test of critical thinking was highly significant. In the experimental group the mean gains between grade levels were not significantly different, nor were they significantly different between ability groups or between boys and girls. The teachers reported that some pupils developed ability to think more critically in science, arithmetic, language, social studies, and reading.

Ambiguity Detection as an Aspect of Critical Thinking

Nichols (1965) investigated the ability of students in grades four, five, six, and nine to deal with sentences containing ambiguities and the relationships to other selected factors. Evaluation and analysis of this aspect of critical thinking was carried out with a fifty-item test constructed by the investigator and by taped interviews with thirty-six high scorers and thirty-four low scorers on the ambiguity detection test. The findings indicated that high scorers appeared to have "a sense of direction" in dealing with ambiguous terms, tended to concern themselves with "specifics" in the ambiguous item stems, and tended to be "objective" in their approach. Low scorers appeared to lack these methods and seemed to be "confused" in their approach to the ambiguous items.

Nichols found moderate positive correlations from .326 to .525 between scores on the measure of ambiguity detection and that for

reading achievement, word knowledge, and IQ. Nichols concluded that the ability to detect ambiguity appears to be moderately related to language skills and IQ and that this ability appears to increase at each grade level tested.

The Relationship of Critical Thinking to Other Factors

Hendrickson (1960) investigated the relationships between critical thinking and several other factors. The following functional definition of critical thinking was used:

. . . the ability to detect persuasion, to determine facts which are important in the solution of a problem, and to interpret printed paragraphs. The latter activity includes inductive-deductive reasoning as well as suspension of judgment (p. 4).

A critical thinking test was constructed to measure this ability as it was defined.

Hendrickson found that the largest relationships were between critical thinking and reading comprehension ($r = .68$) and between critical thinking and Mental Factors, Verbal ($r = .67$). There were significant sex differences in favor of girls in critical thinking, pupil adjustment, total reading, and total language at the .05, the .01, the .01, and the .001 levels, respectively.

Summary

A review of the literature in critical thinking yielded optimistic findings regarding the design of classroom procedures for its development. Lessons emphasizing the use of critical thinking skills with content related to the usual school subjects were successfully employed at elementary and high school grade levels. The use of a simplified version of the problem-solving

process was found to be effective in elementary school (Maw, 1959).

Investigators constructed paper and pencil tests and found that these detected gains in critical thinking due to special instruction. Measures of critical thinking ability correlated at .46 to .68 with measures of intelligence and of reading. With one exception (Hendrickson, 1960) there were no significant differences between boys and girls in the ability to think critically.

The research on critical thinking augurs well for attempts to use the problem-solving steps and planned teaching strategies for improving critical thinking in elementary school.

V. LITERATURE ON REFLECTIVE INQUIRY IN SOCIAL STUDIES

Introduction

Investigators of reflective thinking and inquiry in social studies have designed and evaluated teaching strategies for the development of critical thinking skills. Although the Indiana Experiments (Massialas, 1963) were primarily concerned with models of reflective thinking, the development and measurement of critical thinking skills were given foremost consideration and the findings are most pertinent to this experiment.

Reflective Thinking in High School

Massialas (1961) developed a reflective thinking method of teaching world history to grade ten students and analyzed the results of standardized tests, daily calendars and tapes of teaching episodes. Massialas instructed both the experimental and the control groups. In the experimental group "springboards" were used to introduce insights or hypotheses to be explored for their logical implications. Various

sources of information were used to elaborate and test the hypotheses and implications to arrive at conclusions or causal generalizations.

A model of reflective thinking was used as a basis for developing lesson plans. It contained the following elements that were not necessarily used in the same rigid order or completeness:

1. The recognition of the springboards
2. The identification and clarification of a hypothesis
3. The drawing of logical implications in the form of "if-then" deductions
4. The testing of these deductions on the basis of available data
5. The drawing of a warrantable conclusion (pp. 58-59).

Essay and objective tests that were used in the experimental group involved the critical examination, interpretation, and identification of generalized statements from descriptive sources. Factual information was tested incidentally.

Massialas constructed a model of critical thinking for the purposes of discussing and analyzing the calendar and recordings. His model included the following tasks and skills:

1. Hypothesizing
2. Defining and clarifying
3. Enlarging the perspective
4. Identifying and probing assumptions
5. Drawing logical implications
6. Producing relevant information
7. Generalizing and distinguishing among different kinds of generalizations
8. Recognizing material fallacies in propositions
9. Relating propositions to each other in terms of their consistency and extent of purported explanatory power

10. Developing a sensitivity to fact and proof (1961, pp. 75-76).

The Cooperative World History Test and the Cooperative Sequential Test of Educational Progress (STEP), Social Studies were administered as pre- and post-tests to the sample of four classes divided into two equivalent groups. The duration of the experiment was eighteen weeks. The failure to obtain a significant difference between the experimental and control groups on the STEP test was explained as a short-coming in the test which measured mainly the recall of generalized statements and interpretations. On the basis of results from the Cooperative World History Test it was concluded that the experimental group learned as many facts as the control group who received instruction intended to impart a body of factual knowledge.

Analysis by Massialas of the calendar and recordings of class episodes provided evidence that the students of the experimental group demonstrated a relatively high sensitivity to the skills, abilities, and processes set out in the model of critical thinking. As the experiment progressed these students increased their ability to engage in the critical enterprise in a spontaneous, relatively unstructured, and informal manner. The experimental group became less teacher-directed toward the end of the experiment and, by themselves, provided the necessary cues to elicit student responses.

Cox (1961) conducted an experiment using a reflective thinking method of teaching United States history in high school. His research design, method of teaching, and modes of measurement and evaluation were similar to those used by Massialas (1961). A model of critical thinking was developed and reference was made to it in analyzing the

calendar and tape recordings of the experimental group. Lesson plans used the following elements from the model of critical thinking. At times some steps were eliminated or the order was changed:

1. Orientation. The recognition or assignment of springboards
2. Hypothesis. The identification and clarification of a hypothesis
3. Exploration. The drawing of logical implications in the form of if-then deductions
4. Evidencing. The testing of these implications on the basis of available data.
5. Generalization. The drawing of a warrantable conclusion--usually in the form of if-then-always generalizations.
(p. 71).

On the basis of the gains shown on the Cooperative American History Test and the Sequential Test of Educational Progress, Social Studies there were no significant differences in the knowledge of facts or critical thinking ability between the students of the experimental and control groups. Cox concluded that the experimental group did increase their ability in critical thinking as shown from analysis of the calendar and tape recordings. The application of the model of critical thinking to instruction in history improved the ability to think critically but the test used was considered inappropriate to detect the increase.

Reflective Thinking in Junior High School

Cousins (1962) constructed a theoretical model of reflective thinking and developed a teaching method to achieve its goals in grade eight social studies. One grade eight class was taught by Cousins for five months to develop the skills of reflection as stated in the theoretical model. The model also served as the basic criterion for analyzing the recorded classroom discussions and was

revised after the analysis. Acts of reflective thinking that would be carried out by children were subsumed under the following headings:

- A. Understanding and Interpreting Materials.
- B. Developing and Testing Insights.
- C. Exploring Generalizations.
- D. Reconsideration of Previously Accepted Ideas (pp. 74-77).

The Cooperative Social Studies Test, the Watson-Glaser Critical Thinking Appraisal, and a test constructed by Cousins to measure the results of the instruction were administered before and after the study. A daily account of the instruction was kept and the classroom discussions were tape recorded and analyzed by three evaluators in addition to the researcher. As revealed by these analyses the study group as a whole showed improvement in their ability to utilize reflective thinking skills. The mean score gains on the two standardized tests and the teacher constructed test of reflective thinking were significant at the .01 level .

The following conclusions reached by Cousins are considered relevant:

Pupils in social studies classes can be explicitly taught to think reflectively without jeopardizing the acquisition of factual information pertinent to the social studies

The reflective consideration of problems, and the skills used in this process, can be improved by instruction which is explicitly designed for this purpose (1962, pp. 142-145).

A Problem-Solving Approach in High School

Elsmere (1961) experimented with a problem-solving approach in teaching United States history in high school. The steps of problem-

solving as it was used in the study were: (1) stating the problem, (2) hypothesizing or selecting courses of action, (3) discussing the problem, and (4) drawing conclusions (p. 6). Elsmere taught the experimental class using a problem-solving approach while another teacher taught the control class. Elsmere constructed an objective test on the history that was taught and a subjective test of problems to which students wrote answers in conformity with the four problem-solving steps. The major hypothesis, that a problem-solving approach to teaching United States history produces significantly greater achievement in knowledge of historical facts and problem-solving ability than a traditional approach, was supported and accepted.

Improving Reflective Thinking Through an Analysis of Fundamental Concepts

McGarry (1961) investigated the effects of making the analysis of fundamental concepts the primary goal of instruction. Students from the introductory social studies course of the University of Minnesota's General College were selected for the experimental and control groups. The experimental group emphasized the understanding of social concepts or generalizations whereas the control group concentrated on understanding through the mastery of pertinent data. On the American Council on Education Test of Critical Thinking in Social Science both groups displayed significant gains in critical thinking but the experimental group made greater gains.

Summary

An important implication in the studies on reflective thinking

or inquiry is that critical thinking skills can be effectively taught in social studies by employing a model with distinguishable phases. Cousins (1962) demonstrated that a test constructed to measure critical thinking ability can be used to detect gains made as a result of applying a model of reflective thinking in social studies. Experimental groups instructed by a reflective inquiry method or problem-solving approach achieved as well in the knowledge of facts as the control groups and in one study surpassed the control group.

The models of reflective thinking, of inquiry, of critical thinking, and of problem-solving were fundamentally similar in format and encompassed about the same processes and skills. In each model there was generally a progression of stages from recognition of a problem and a suggestion of possible answers, through to procuring evidence and arriving at a conclusion. The investigators acknowledged that the phases were not rigid steps but only a general pattern.

VI. LITERATURE ON CRITICAL THINKING IN SOCIAL STUDIES

Introduction

Several studies that investigated the development of critical thinking skills in social studies were reviewed. Other investigations in social studies were considered when findings were pertinent to the development of critical thinking, its relationships to other intellectual factors, and its measurement.

Measuring Critical Thinking in Social Studies

Few standardized tests have been constructed for the sole purpose

of measuring critical thinking in social studies. Wrightstone (1938) constructed a series of tests to measure the abilities of students (1) to obtain facts, (2) to interpret, or explain the facts obtained, and (3) to apply the conclusions or generalized facts to new or special situations (p. 191). The tests were administered to pupils in the fourth, fifth, and sixth grades of the "activity" and "non-activity" schools of New York City. The "activity" schools, which had been using the newer practices for about a year, had slightly higher average scores. The higher average scores were attributed to the fact that practice in critical thinking was provided.

A Comparison of "Doing" and "Telling" Methods

Anderson, Marcham, and Dunn (1944) developed five problems in social studies at the seventh and tenth grade levels. These were taught by two methods designated as "doing" and "telling". The authors identified the following elements of critical thinking:

1. Identifying specific facts, 2. selecting relevant facts, 3. organizing facts in terms of meaningful sub-topics, 4. arranging sub-topics in logical order, 5. making inferences from specific facts and from trends, 6. distinguishing between fact and opinion, and 7. recognizing situations in which insufficient evidence makes it difficult or impossible to draw a clearcut conclusion (p. 242).

A multiple-choice examination constructed by the investigators consisted of two parts: "Abstracting and Organizing Information" and "Drawing Conclusions". The results of the tests indicated that there were no significant differences between the two methods used. From a comparison of differences between experimental and control groups on different parts of the tests the authors concluded that "the critical thinking problems made their most important and distinctive contribution in developing skills associated with the making of inferences and the

drawing of conclusions (p. 250)."

Teaching Critical Thinking in Social Studies to Students of Low Ability

Miller and Weston (1949) reported on the extent to which the skills of critical thinking were developed in tenth grade children of low ability. A problem-solving method was employed in a geography class and the Wrightstone Test of Critical Thinking in Social Studies was used as the measurement instrument. The authors found improvement greater than that for a control group only on Part II of the test.

The authors:

. . . observed increased skill in the students' ability to distinguish between fact and opinion, between relevant and irrelevant data, to listen, to discuss, and to recognize various sources of information.

. . . saw the students grow in their ability to do group planning which is inherent in solving problems.

. . . saw the beginnings of a recognition of value of stating criteria before making decisions or taking action. (p. 316).

Although this experiment lacked a rigid design and the conclusions depended on subjective evaluations of student progress, the reported findings do hold promise for teaching critical thinking to slow learners.

The Relationship of Critical Thinking in Social Studies to Other Factors

Cotter (1951) investigated the ability of sixth grade children to think critically in social studies. The Wrightstone Test of Critical Thinking in Social Studies scores were correlated with other selected factors. A substantial relationship (.67) was found between scores on the test of critical thinking in social studies and the ability to retain facts in social studies as measured by the Stanford Achievement Test in Social Studies. Scores on the Pintner General Abilities Test

correlated at .70 with those on the Stanford Achievement Test and at .71 with the measures of critical thinking in social studies. Although the girls did better than the boys in the test of critical thinking in social studies, the difference was not statistically significant. On the other hand, the difference was statistically significant in favor of the boys on the measures of the ability to retain facts in social studies. The disparity between measures of critical thinking in social studies and the ability to retain facts was interpreted as follows:

This difference in abilities may point to the conclusion that the possession of social studies facts does not guarantee effective thinking with them (p. 171).

Explanation as a Process in Critical Thinking

Swift (1959) studied and discussed "explanation" as a sub-process of critical thinking in social studies. Explanation was considered to be the process of accounting for states of affairs, acts, situations, and social phenomena of all sorts and as such to be continuously present in social studies. A working definition of critical thinking in social studies was taken to be "the logical-linguistic process of examining the suitability of statements purporting to offer social knowledge (p. 4)." An explanation as the assertion of a reason or a cause must be examined for critical thinking to occur. Swift developed the concept of explanation to include ways of teaching about explanation as an aspect of critical thinking in social studies. One of several possible lines of procedure was the use of questions in class to aid in "explanation appraisal".

Questioning on these occasions . . . would be directed toward the elements of an explanation, the reasons, the conclusion

stating the explicandum, and the probable generalizations supporting the argument (p. 130).

Assigned Questions and Critical Thinking in Social Studies

Hunkins (1966) investigated the influence of analysis and evaluation questions as used in written assignments to develop critical thinking in sixth grade social studies. During a period of four weeks, Group A and Group B students read designated pages in the social studies textbook and wrote answers to the questions on worksheets. Group A worksheets stressed analysis and evaluation questions whereas Group B had questions requiring the recall of knowledge. The questions were based on the hierarchical categories in the Taxonomy of Educational Objectives (1956) by Benjamin Bloom. Knowledge questions required the recall of ideas, facts, materials, or phenomena. Analysis questions necessitated the arrangement and rearrangement of information into elements, relationships, and organizations. Evaluation questions required a judgment employing criteria such as accuracy, effectiveness, economic quality, or satisfying quality. Critical thinking was considered to incorporate the intellectual skills of "(1) identifying central issues, (2) recognizing underlying assumptions, (3) evaluating evidence or authority, and (4) drawing warranted conclusions (p. 69)."

Hunkins used the Social Studies Inference Test (Taba, 1964) to detect improvement in critical thinking and a criterion test constructed to measure social studies achievement. The students who had used questions requiring analysis and evaluation obtained significantly higher scores on the social studies achievement test than did the group who had received knowledge questions. There was no significant difference between the two groups in critical thinking as measured by

the Social Studies Inference Test. The author noted that the developer of the Inference Test did not make any claim that it would provide an adequate measure of gross critical thinking nor was there an overall score from the test. In explaining the results of testing for critical thinking the author pointed out that in the experiment the children were restricted to answering questions with no opportunity for discussion. It appears pertinent that the Inference Test and its revised form (Taba, 1966) were used in studies where student discussion was essential in the growth of cognitive strategies. One can only speculate on the effects planned class discussions might have had in the research by Hunkins.

Teaching Strategies and the Development of Cognitive Processes

The research on kinds and methods of using classroom questions was greatly enhanced by Taba (1966) in a research project that focused on the development of cognitive processes. The study analyzed, in terms of cognitive processes, "two poles of interaction: teacher behavior and the quality of student responses (p. 29)." The study focused on three cognitive tasks: "1. concept formation; 2. generalizing and inferring through interpretation of raw data; 3. the application of known principles and facts to explain and predict new phenomena (p. 37)." The importance of classroom questions was emphasized:

A crucial factor in developing student skilfulness in the three cognitive tasks is the proper strategy of question-asking on the teacher's part. First, this strategy involves asking open-ended questions and thus providing the opportunity for responding on different levels of abstraction, sophistication and depth, as well as expressing different perspectives. Secondly, it involves a strategy of matching the pace of the questions to the students' capacity for mastering the skills at each step . . . (p. 43).

The following results of the project by Taba are pertinent to

the development of critical thinking in social studies:

1. Time spent on the processing of data did not preclude high achievement in learning information.

2. The groups which had been trained in the skills of the cognitive tasks were superior to untrained groups in ability to discriminate, to infer from data, and to apply known principles to new problems.

3. Analysis of the tapescripts showed that the trained groups were superior to the untrained groups in: (a) the number of thought units and their length and complexity, (b) operating on higher levels of thought, (c) producing more abstract and complex inferences and supporting these inferences, (d) constraining the hypothesizing to the data and to a realistic view of the problem, (e) extending the hypothesizing across a longer chain of causal factors, and (f) participating in the more complex tasks such as inferring from data and applying principles in order to hypothesize and predict (Taba, 1966, pp. 222-224).

Developing Critical Thinking in High School Social Studies

Most research into critical thinking in social studies has been done at the high school level. The study by Rothstein (1960) is typical of the approach commonly used and its findings support those of similar studies. Two groups of grade eleven students in American history were matched on the basis of test scores in mental abilities, English, reading, and critical thinking skills. In the experimental group where the skills of critical thinking were emphasized there were significant gains in critical thinking as measured by the Watson-Glaser Critical Thinking Appraisal and compared to the control group. The

experimental group acquired the same amount of information as the control group in which subject-matter information was emphasized. There was no significant correlation between the information test scores and those of critical thinking ability but positive intercorrelations existed between scores for IQ, reading, and critical thinking.

The following conclusion by Rothstein is pertinent to the development of critical thinking:

It is clear that growth in thinking ability can be expected to derive from focused instruction; that when there is such focus, the students reflect in their test scores increased ability to apply the techniques (p. 3)..

Thus teaching strategies that direct and encourage the use of critical thinking skills can be expected to develop the students' ability to think critically.

Researchers have investigated the relationship of critical thinking to other intellectual processes. Gilbert (1961) tested the relationship of creativity to critical thinking and to performance in social studies. In a study including 597 eleventh-grade students Gilbert found a significant correlation between the total creativity score and the critical thinking score, with intelligence held constant. It was also concluded from a consideration of teachers' marks and measurements of creativity and critical thinking that highly creative and proficient thinkers do not receive academic rewards commensurate with these abilities.

Summary

A review of the literature on critical thinking in social studies produced findings that supported those reported in research on reflective thinking and inquiry. Teaching strategies which emphasize

the practice of critical thinking skills develop the ability to think critically. The level of teacher questions influences the children's facility in higher cognitive processes. The learning of social studies content is not diminished by an emphasis on the critical thinking skills.

Critical thinking in social studies can be taught to slow learners if the methods used take their special needs into account.

VII. THE NEED FOR FURTHER RESEARCH

The related literature supported the assertion that students who are specifically taught to use critical thinking skills become more proficient in critical thinking than students who do not undergo explicit instruction. Several investigators successfully employed models of critical thinking in social studies (Massialas, 1963). The models were used as guides in the management of classroom discourse so that the discussants would move from one frame of reference to another in arriving at solutions to social studies problems. The research in social studies that demonstrated the fruitful use of models of critical thinking and a problem-solving approach were carried out at the secondary school level. Further investigation is required to determine the effectiveness of these classroom procedures in elementary school social studies.

A simplified version of the problem-solving process and prepared materials were effectively used to improve critical thinking at the elementary school level (Maw, 1959). The possibility that prepared materials and a simplified version of the problem-solving phases could be used effectively in elementary school social studies invites

further investigation.

Wrightstone (1938) constructed a test to measure critical thinking in elementary school social studies but it is now out of print and no standardized test has been constructed to replace it. The paucity of devices to measure critical thinking in social studies suggests that the classroom teacher would welcome additional tools for its measurement.

Among the investigations concerned with the problem of improving critical thinking in elementary school social studies, none was found which attempted to explore the possibility of using resource materials according to a prescribed model in prepared lessons. This experiment was an attempt to develop lessons which could be used to teach critical thinking in grade six social studies and to evaluate the results.

CHAPTER III

MATERIALS, INSTRUMENTATION, AND DESIGN

I. INTRODUCTION

The purpose of this chapter is to set out the materials, tests, and experimental procedures that were used in the experiment. The research design included experimental and control groups, a designated treatment, and pre- and post-tests to measure the results.

II. RESOURCE MATERIALS AND LESSONS

Before the experiment could begin it was necessary to assemble resource materials and construct lessons for classroom teachers. A social studies topic was chosen with two considerations in mind: (1) the content of the lessons must fit into the regular curriculum to be more acceptable to classroom teachers; and (2) the topic should not be covered in the available resource materials. The latter would restrict the classes to using the prepared materials. Lessons on the Indian and Metis people of Northern Saskatchewan were an appropriate addition to the curriculum guide topic "Saskatchewan Today" and few, if any, resource materials were available in the schools.

Resource Materials

The difficulty of procuring resource materials with information on the Indians and Metis of Northern Saskatchewan restricted the scope and organization of the lessons. Published materials suitable for

classroom use contained occasional references to the topic but the coverage was much too superficial to be of use in the lessons. All known sources were canvassed to procure resource materials which would depict life in the northern villages of Saskatchewan. The writer was greatly assisted in the search for and selection of appropriate resource materials by previous experience in teaching Indian and Metis children in a Northern Saskatchewan community.

A major part of the information presented in each lesson was derived from thirty-five millimeter slides. Over a hundred slides were collected from teachers in Northern Saskatchewan, a government agency, and other persons who had recently lived there. Out of these, fifty-three slides were selected for the lessons and were numbered for ready reference. A short description containing a few pertinent facts for each slide was provided for each teacher. The list of descriptions for the numbered slides is contained in Appendix B.

Since reference books appropriate to the topic and grade level were not available, the only suitable alternative was to screen government reports for pertinent data. Research on the economic and social development of the Indians and Metis of Northern Saskatchewan was completed for the Centre of Community Studies at the University of Saskatchewan, Saskatoon, by an economist, an anthropologist, and a specialist in community development (Buckley, Kew, and Hawley, 1963; Buckley, 1962; and Kew, 1962). These research reports yielded an abundance of data on the Indian and Metis communities of Northern Saskatchewan but unfortunately most of the narrative appeared to be difficult for grade six students. The use of excerpts from the reports was considered feasible in grade six provided the teachers

were directed to read difficult passages and assist in detecting the facts. A careful selection was made of short paragraphs, charts, and graphs that presented basic data pertinent to the topic. These items of information were numbered for ready reference and assembled into student booklets. Several of the items were constructed by the investigator when no suitable quotation could be found. Although most of the data presented in the student booklets is of an economic nature, several items yield insights into social trends and structures in the Indian and Metis villages. Appendix C contains a copy of the student booklet that was assembled to present basic data on life in Indian and Metis villages.

In addition to the above, a few other materials were assembled for the teachers. Transparencies were used to present maps of Northern Saskatchewan showing the location of villages, the vegetation regions, and the fur conservation blocks. Duplicated line drawings of ptarmigan and the common species of fish found in Northern Saskatchewan were given to each classroom. A list of prices at a Northern Saskatchewan village store was included. The teachers involved obtained a large detailed map of Northern Saskatchewan, a Saskatchewan road map, and the Department of Natural Resources Resource Book that contained descriptions and pictures of the vegetation and animal life in Saskatchewan.

Lessons

The writer constructed twenty-four lessons and assembled these into teacher guides for the experimental group. A copy of the guide containing an introduction and the lessons was placed in Appendix A.

The lessons concentrated on the classroom use of the resource materials according to a simplified model for critical thinking in social studies. The lack of additional resource materials in the schools gave some assurance that the instruction given in the experimental classrooms would center on the prepared materials.

Since the focus of attention in the experiment was on classroom utilization of resource materials while employing a model for critical thinking in social studies, no attempt was made to organize the lessons and materials according to a "concept based" curriculum (Taba, 1967). Lists of general purposes and schedules for presentation of the resource materials were given to both the experimental group and the control group teachers; the latter did not receive the prepared lessons. To have organized the materials according to Taba (1967) may have had positive effects in the control group on the development of the skills under investigation. The relationship of critical thinking to curriculum organization was suggested by Taba (1950).

As contained in the teacher's guide, the introduction to the lessons described classroom procedures to promote critical thinking in social studies. These closely followed the suggestions in Burton et al (1960) and Massialas & Cox (1966). A simplified version of a model for critical thinking in social studies was also presented along with an example of how it could be used in the classroom. The model that was used was almost wholly based on the six phases of reflective thinking proposed by Massialas & Cox (1966) and derived from the research reported in Massialas (1963). The procedures proposed by other writers (Massialas, 1963; Goldmark, 1968; Maw, 1959) were used to modify the six phases suggested by Massialas & Cox (1966). A simplified model to

guide classroom discussions and to give them purpose was set out as follows:

GUIDE FOR THINKING IN SOCIAL STUDIES

1. State exactly what we are trying to find out or solve.
2. Suggest possible answers from what we already know.
3. Decide what would support our answers.
4. Find evidence that would support or weaken our answers.
5. Consider the evidence and change the answers into sound conclusions.

In addition to the above guide, which was used with the students as in Maw (1959), the teachers used a diagram with the following phases: PROBLEM, SUGGESTED ANSWERS, ASSUMED BASES FOR THE ANSWERS, EVIDENCE, DRAWING CONCLUSIONS, and a sixth phase that was part of each of the others: KEEP THE MEANING CLEAR. The experimental group teachers kept the diagram on the chalkboard or bulletin board to guide class discussion in the beginning lessons. Copies of the model and the diagram are presented in Appendix A.

The suggestions to the teacher, in the introduction to the lessons, requested that the students build a list of "Hints for Clear Thinking" and keep it displayed. Two possible hints that were given as examples are: "Do not go beyond the facts" and "Choose evidence related to the problem". The introduction and the lessons contained several reminders that the students must contribute the ideas and that the teachers must not give them the answers or conclusions.

The major part of the teacher's guide contained the twenty-four lessons, each of which was organized under three headings: PURPOSE, MATERIALS, and PROCEDURE. The Purpose contained a rather general

statement of the theme of the lesson but did not list specific understandings. The resource materials considered appropriate for the lesson were listed under Materials. Under Procedure several paragraphs stipulated how the simplified model for critical thinking in social studies was to be applied using the listed resource materials. Examples of possible student answers were included to give further guidance to the teacher.

Pilot Study

To ascertain the appropriateness of the lessons and resource materials a pilot study was undertaken in April, 1969 at a school in the city of Edmonton, Alberta. A grade six teacher with a Master's Degree in Sociology used the first several lessons in two grade six social studies classes. These lessons and resource materials were reported to be appropriate for the purposes of the experiment. The introduction and first lessons were found to contain more detail than necessary for an experienced teacher but they were retained unchanged to give some assurance that uniform methods would be used. The lessons not used in the pilot study, due to a lack of time, were patterned after the first ones, which were found suitable.

Teacher Evaluation of the Lessons

Each experimental group teacher received a two-page evaluation sheet on which the lessons were graded under several topics. This was designed to provide data on the appropriateness of the lessons for the grade six classrooms. Items were constructed to obtain information on the following: (1) student interest, (2) stimulation of discussion, (3) suitability to the class, (4) the ability group finding lessons most

suitable, (5) ability of children to derive facts from the slides or the student booklet, (6) success in using the simplified model, (7) transfer of skills to other subjects, and (8) general comments.

III. TESTS

A search was made for standardized tests to measure the results of the instruction in the experiment but none adequate for the task was found. The Wrightstone Test of Critical Thinking in Social Studies (Wrightstone, 1939) has been out of print for some time. Other standardized tests that were constructed for the purpose were appropriate for the secondary school level. Some achievement tests in social studies purport to measure critical thinking along with the recognition of recall of understandings but these were judged too general to measure specific gains.

The Critical Thinking in Social Studies Test

Since no standardized test was available, it was necessary to construct a test to measure gains in critical thinking in social studies. It was conjectured that a test using familiar content might be a more reliable measure of critical thinking in social studies. Information on the Province of Saskatchewan was presented in the test items as content familiar to the subjects but not identical to the subject matter of the experimental lessons.

The Critical Thinking in Social Studies Test contains eighty items and is divided into three parts: 1. Drawing Conclusions From Facts, 2. Basis for an Argument, and 3. Support for an Argument. Suggestions for the format of the items were obtained from several sources (Morse & McCune, 1964; Taba, 1942; and Wrightstone, 1939).

In the test, a paragraph, chart, or graph of information on the province of Saskatchewan is provided for each cluster of five items. A copy of the test is contained in Appendix D.

In Part I statements are checked against the given facts to determine if the inferences are true, probably true, false or probably false, or one cannot tell according to the information that is given. Rather than repeat the four choices after each item the choices are listed at the top of each page as follows:

- | | |
|------------------|----------------------------|
| A. TRUE | C. FALSE OR PROBABLY FALSE |
| B. PROBABLY TRUE | D. CANNOT TELL |

The forty items are arranged in five item clusters, for example:

Petroleum and natural gas are obtained from rock below the surface in southwestern and southeastern areas of Saskatchewan and near Lloydminster. The petroleum and natural gas are found in certain types of sedimentary rock. This type of rock contains sandstone, shale, and sometimes limestone. The only sure way of finding out if there is petroleum in the rock below is to drill an oil well. This takes time and is expensive because many times petroleum is not found in the well.

31. Petroleum and natural gas are found in all types of sedimentary rock.
32. There are oil wells in southwestern Saskatchewan.
33. Petroleum companies search for areas which have sandstone, shale, or limestone rocks.
34. Petroleum and natural gas are refined in Saskatoon.
35. There are several ways of being certain that there is petroleum under the surface.

In Part II, each statement is viewed against an argument to decide if it is stated as a fact, as an assumption in the argument, or one cannot tell from what is given. The three choices are listed at the top of each page as follows:

- | | | |
|-----------------|-----------------------|------------------------|
| <u>A</u> . FACT | <u>B</u> . ASSUMPTION | <u>C</u> . CANNOT TELL |
|-----------------|-----------------------|------------------------|

The twenty items for Part II were arranged in five item clusters, for example:

Saskatchewan has fourteen provincial parks, one national park, and thirty-seven regional parks. Thousands of people visit these parks each summer and many bring tents, tent trailers, and trailers. Having many tourists helps the province of Saskatchewan.

CONCLUSION: The government should build more camping grounds for the many visitors who come to Saskatchewan.

49. There are not enough camping grounds in Saskatchewan at present.
50. Northern Saskatchewan has many provincial parks.
51. The parks in Saskatchewan are operated by different governments.
52. More tourists will come if we have more camping grounds.
53. Many people come to visit our parks.

In Part III, statements are considered as supporting, weakening, or doing neither for a stated argument. The three choices are repeated on top of each page as follows:

- A. SUPPORTS THE ARGUMENT
- B. WEAKENS THE ARGUMENT
- C. NEITHER A NOR B

Twenty items are arranged in five item clusters, for example:

Uranium City is near Lake Athabasca in the northernmost part of Saskatchewan. There is no road to Uranium City.

CONCLUSION: A highway should be built from Prince Albert to Uranium City.

77. It is difficult to build roads in Northern Saskatchewan.
78. It is expensive to carry supplies by airplane from Prince Albert to Uranium City.
79. In 1964 there were 8,924 miles of provincial highway in Saskatchewan.

80. Trucks from Prince Albert want to get pulpwood from Northern Saskatchewan.
81. There are not enough people in Northern Saskatchewan to use the highway.

In March, 1969 a preliminary draft of the test was constructed and revised several times. A staff member and a graduate student read the initial draft of the test and made suggestions for the revision of several items and some aspects of the format. After the second pilot study another staff member, well-known in the field of reading comprehension, suggested the revision of several items and considered the test valid for obtaining a gross measure of critical thinking.

The test was administered in Saskatoon, Saskatchewan, to three boys of ages ten, eleven, and eleven. The ten-year-old boy in grade five obtained a score of forty-eight and the eleven-year-old boys in grade six obtained scores of thirty-eight and fifty-four on the eighty item test. In the discussion after the test the boys readily understood why they had made certain errors.

The first pilot study was carried out in April when the test was administered to forty-seven grade six children in a school in Edmonton, Alberta. The scores obtained were found to correlate at .67 with IQ scores obtained from the school records. Item analysis was carried out with Program TEST 04 on an IBM 360/67 computer and several items were revised accordingly. Items with a biserial correlation of less than 0.20 were replaced by similar items constructed in the light of the item analysis statistics. Before discarding an item, consideration was also given to other factors presented by the analysis, such as difficulty level, the percent of examinees marking each choice, and the

item reliability index. The test statistics for Pilot Study One were listed in Table I on the following page. The cutting points separating the five groups were at 35.0, 40.0, 47.0, and 53.0. This indicated that the twenty percent of the examinees obtaining the lowest test scores had scores below 35.0, and similarly the top twenty percent had scores above 53.0. The three other groups were interpreted in the same manner.

Subsequent to the above pilot study the test was administered to forty-six grade six children in another Edmonton school and an item analysis was carried out. The test statistics for Pilot Study Two were listed in Table I and indicated that the test held promise as a reliable measuring device. The cutting points for the five groups were at 35.0, 40.0, 44.0, and 49.0. Several items were revised, as in the first pilot study, and this copy of the test was used for the pre- and post-tests of the experiment.

The scores obtained by the 247 grade six children who wrote the pre-tests were used with TEST 04 to compute an item analysis and the results were summarized in Table I. The cutting points for the five groups were at 30.0, 35.0, 40.0, and 45.0. A mean of 0.29 was calculated for the biserial correlations of all items. Similarly a mean of 0.45 was found for the item difficulty indices of all items. Item difficulty varied from approximately 0.20 to 0.80. According to the description given for TEST 04 the biserial correlation becomes distorted as the item difficulty deviates greatly from a value of 0.50. Guilford (1965) stated that the KR 20 reliability coefficient gives an underestimate when there is a wide dispersion of item difficulties (p. 461). On the other hand, the difficulty levels

TABLE I
ITEM ANALYSIS AND RELIABILITY STATISTICS
FOR THREE TESTS

Test	Number	Mean	Variance	KR-20 Reliability	Mean of Item Biserial Correlations	Mean of Item Difficulty Indices
Critical Thinking in Social Studies Test						
Pilot Study I	47	44.23	80.14	0.81		
Pilot Study II	47	42.04	94.98	0.82		
Pre-test	247	38.25	65.61	0.75	0.29	0.45
Social Studies Achievement Post-test	243	26.64	43.20	0.74	0.35	0.52
Cornell Critical Thinking Pre-test	248	22.53	28.45	0.67	0.34	0.51

of the items should vary if the test is to discriminate among examinees who are low or high on the ability being measured (Guilford, 1965).

The interpretation of the test reliability statistics should be qualified by the fact that critical thinking in social studies is not likely to be a uni-factor ability. The Kuder-Richardson Formula 20 reliability coefficient is the average of all split-half correlations and indicates the degree to which the test measures one attribute. The biserial correlation that provides an index of discrimination ability for an item is based on the low and high scorers for the whole test. Because the items of different parts of the test were designed to test the application of different critical thinking skills, the top scorers for a reliable item might not be the same for the complete test. Although the interpretation of item analysis statistics for this test had restrictions, there was considered to be enough homogeneity among the abilities being measured for the statistics to suggest test reliability and function as the basis for revisions.

To obtain a further indication of reliability a correlation between scores on the pre- and post-tests of the control group were computed. A correlation of 0.70 was obtained.

The scores of 241 subjects on the pre-tests were used to compute correlations. Critical thinking in social studies pre-test scores were found to correlate at .53 with Verbal IQ and at .40 with the Cornell pre-test scores. The moderate correlation of the test scores with those of the Cornell test reflects both similarities and differences between the two tests. Only Part III of the test appears

to require the application of skills similar to those required in twenty-three items of the Cornell test.

The relationship between the test and the Cornell Critical Thinking Test indicated that both tested something in common but the significance was obscured by the relationship of both tests to IQ. Therefore, models 0 and 00 representing a relationship and no relationship, respectively, when adjustments were made for IQ, were compared by regression analysis to determine if a significant relationship existed between the two tests of critical thinking. A description of regression analysis was included in the latter part of this chapter. The models and results of the analysis were presented in Tables II and III on the following page. In accordance with the results it was concluded that a significant relationship existed between the two tests ($p < .01$) when the effects of IQ were partialled out.

Social Studies Achievement Test

A standardized achievement test was considered inadequate for measuring the knowledge of content achieved through the lessons. It was necessary to construct a test pertinent to the subject matter of the prepared resource materials.

The achievement test--Villages of Northern Saskatchewan--contains fifty-one multiple-choice items designed to measure knowledge of facts and understandings derived from the resource materials. A copy of the test may be found in Appendix E. Each item contains one correct completion phrase or statement and three distracters, for example:

TABLE II

LINEAR REGRESSION MODELS O AND OO

Model number	Criterion variables	Computer weights and predictor variables	Squared multiple correlation	Degrees of freedom
0	$X_7 =$	$2.51U + 0.27X_3 + 0.28X_6 + e$	0.320	3
00	$X_7 =$	$3.34U + 0.32X_3 + e$	0.296	2

TABLE III

COMPARISON OF REGRESSION MODELS O AND OO

Models compared	Degrees of freedom		F ratio	Probability
	numerator	denominator		
0 and 00	1	228	8.013	0.005

32. Winter trapping usually does not continue past the end of January because:
- A. the weather is too cold to visit the traplines.
 - B. the animal fur is of a poorer quality.
 - C. the snow is too deep to set traps.
 - D. the animals hibernate and cannot be found.

The preliminary draft of the social studies achievement test contained sixty-two items. In April, 1969 the test was administered to forty-six grade six children in an Edmonton school. For this pilot study the test mean was 25.15 and the test variance was 23.78. Subsequent to an item analysis of the results, eleven items were discarded and several others were revised.

The scores of 243 subjects on the social studies achievement post-test were used to obtain the reliability statistics shown in Table I on page 55. The means of the item biserial correlations and difficulty indices were 0.347 and 0.52. The cutting points for the five groups were at 20.0, 25.0, 28.0, and 32.0 and the mean score for the sample was 26.64.

The Cornell Critical Thinking Test, Level X

A search for a published standardized test of critical thinking for grade six revealed that none was available. The experimental edition of the Cornell Critical Thinking Test, Level X by Robert H. Ennis and Jason Millman had been used at the junior high school level. The feasibility of the test for grade six had not been shown, but it was noted that the subjects in the sample would be within two months of the completion of grade six.

In March, 1969 a pilot study was conducted wherein the Cornell Critical Thinking Test was administered to thirty grade eight, thirty

grade seven, and thirty-seven grade six students. The subjects were students of average or better academic ability in three schools in Regina, Saskatchewan. Rather than use a formula of subtracting one-half of the wrong from the right answers, the score was taken as the number right as suggested by Maguire (In Ennis & Macmillan, 1968). The means for the forty-seven items in Part I were respectively: grade eight 27.83, grade seven 29.87, and grade six 26.16. For the twenty-four items of Part II the respective means were: grade eight 15.86, grade seven 16.97, and grade six 13.53. After the pilot study it was considered more feasible to use Part I in the experiment rather than the complete test. In Part II the items designed to measure the application of rules of conditional reasoning were considered to be rather difficult for grade six as suggested by the findings of Ennis & Paulus (1965).

Using the pre-test scores of 243 subjects on Part I of the Cornell test, an item analysis was computed and the results were placed in Table I on page 55. In the experiment the total number correct was recorded as the score for each subject. The mean score was 22.53 and the Kuder-Richardson Formula 20 Reliability was 0.67. The mean of the item difficulty indices was 0.51 and that of the item biserial correlations was 0.34. The Cornell pre-test scores correlated at .50 with Verbal IQ scores. A copy of the test was placed in Appendix F.

The Lorge-Thorndike Intelligence Tests, Level 3, Form A

Both the verbal and non-verbal batteries of the test were selected to obtain measures of intelligence for the subjects of the experiment. This test was preferred to tests of mental maturity which were found to include items very similar to those in tests of

critical thinking ability. The Level 3, Grades 4, 5, and 6, re-usable edition facilitated machine scoring.

IV. SAMPLE OF CLASSES

The Population

The population for the experiment consisted of all grade six classes in the Graton Roman Catholic Separate School District Number 13, Regina, Saskatchewan. This excluded classes with combined grade levels.

The Sample

A sample of eight classes was randomly selected from the population of grade six classes. Four classes of the sample were randomly assigned to the experimental group and the remaining four formed the control group. Each of the selected classes was from a different school except for two control group classes.

The number of subjects, and the means and standard deviations of verbal IQ for the experimental group, the control group, and the sample were placed in Table IV. Since the experimental group had a higher IQ mean, adjustments were made when the results of the two groups were compared in the analysis of test data. Several subjects who were not present for one or more tests were dropped from the sample and were not included for the analysis of test results.

V. DIRECTIONS TO THE TEACHERS

Experimental Group Classes

Each teacher of an experimental group class received the resource materials and a guide containing the lessons prepared by the

TABLE IV
MEANS AND STANDARD DEVIATIONS OF
VERBAL INTELLIGENCE QUOTIENTS

	Number of subjects	IQ mean	IQ standard deviation
Experimental group	122	112.07	13.82
Control group	109	107.95	12.80
The sample	231	110.13	13.50

writer when the pre-tests were administered. On this occasion the writer conferred with each teacher regarding the planned use of the materials and the purposes of the instruction. While the pre-tests were being administered by the writer, the classroom teacher perused the materials and read the teacher guide. Further elaboration on the lessons was provided in response to teacher queries. It was insisted that the teaching procedures were to be kept in strict confidence and that their divulgence to other teachers could endanger the success of the experiment. Upon completion of the pre-tests each classroom began using the lessons and continued the project for seven weeks.

A few days after the experiment had begun, the writer visited each classroom a second time to administer the Lorge-Thorndike Tests. It was noticed that by this time all teachers had begun instruction and "aids" to critical thinking in social studies were listed on chalkboards or bulletin boards. The initial progress in the lessons was discussed.

Control Group Classes

The control group teachers received the prepared resource materials and a few sheets which suggested purposes and an appropriate sequence for presenting the resource materials. In order to provide some assurance that the subject matter coverage would be similar to that in the experimental group, the outline given to each control group teacher contained what was listed under "Purposes" and "Materials" in the prepared lessons (Appendix A). In this way the prepared resource materials would be presented in a similar order in both groups but the control group would follow the regular classroom teaching strategies when presenting the resource materials.

The materials were given to each control group teacher when the pre-tests were administered. Each teacher was asked to use the resource materials and told that the suggested purposes and sequence of presentation were not mandatory. It was added that the students would require assistance in using the student booklets. No guidance on teaching procedures was given although general questions aside from method were answered. The teachers were informed that the assembled resource materials were being tried out, but the full nature of the experiment was not revealed. The writer cautioned the teachers about discussing the experiment with other staff members.

VI. ADMINISTRATION OF THE TESTS

The Pre-tests

The Critical Thinking in Social Studies, social studies achievement, and Cornell Critical Thinking tests were administered as pre-tests to all classes in the sample commencing May 1, 1969.

The three tests were administered by the writer in the above order in a half-day visit to each class. A schedule was followed whereby two experimental group classes and two control group classes were tested in morning sessions and two classes of each group were tested in afternoon sessions. The order of visits to classrooms varied to avoid giving precedence to classes of either group in beginning the experiment.

During the administration of the pre-tests each teacher of both groups was absent from the classroom and was not permitted to see the tests.

When administering the tests the following writing times were strictly adhered to:

Critical Thinking in Social Studies Test

Part I--twenty-seven minutes

Part II--ten minutes

Part III--ten minutes

Social Studies Achievement Test

--thirty-three minutes

Cornell Critical Thinking Test.

Part I--thirty minutes

These times were found to be ample for all but a few subjects. In the administration of the Cornell test all examples were discussed at the beginning rather than request the subjects to do this on their own as implied in the test.

The Lorge-Thorndike Intelligence Tests

After all pre-tests had been administered, the writer

administered the Lorge-Thorndike Intelligence Tests to all classes in the order of the pre-test sessions. Both batteries, Verbal and Non-verbal, were given in a quarter day visit to each classroom.

Several factors made the Non-verbal scores suspect and these were not used in the experiment. The Non-verbal Battery was administered immediately after the Verbal at a time when the subjects were fatigued. Of more significance was the fact that in a few classes a negative attitude developed when the timing of the Non-verbal Battery coincided with recess. For a number of subjects there was a substantial spread between Non-verbal and Verbal scores, and the latter better reflected the individual IQ test scores in school records.

The Post-tests

The Critical Thinking in Social Studies, social studies achievement, and Cornell Critical Thinking tests were administered as post-tests by the writer. Administration procedures identical to that for the pre-tests were utilized to ensure uniformity. Each class received the post-tests at the same time of day as the pre-tests and precisely seven weeks after the pre-tests.

VII. DATA ANALYSIS

Linear Regression Analysis

Program MULR04 Regression Analysis, designed for use on the IBM 360/67 computer, was used exclusively to analyze the test data according to the procedures given by Hunka (1965), and Flathman (1968). This program tests the significance of differences between groups

and the significance of relationships between variables, and it calculates the correlations between all variables. New variables such as gains on tests and the representation of interaction between grouping and IQ can be generated from the existing variables by data transformation statements that are inserted into the MULRO4 computer program.

Linear regression models were created to represent the hypothesized relationships between the variables or differences between groups. In each model a criterion variable was predicted from one or more predictor variables, for example:

$$X_7 = A_0U + A_3X_3 + A_6X_6 + e$$

One model, such as the one above, was designated the "unrestricted" or full model and contained the hypothesized relationship. A second model designated the "restricted" model embodied a restraint that is reflected by the null form of the hypothesis, for example:

$$X_7 = A_0U + A_3X_3 + e$$

The MULRO4 program calculated the squared multiple correlation (RSQ) that existed between the criterion variable and the predictor variables. Weights (represented by A's in the example) were calculated for each predictor variable including the unit predictor variable (U). The squared multiple correlations and the degrees of freedom of the full and restricted models were used to compare the two models. The comparison was made using an F test which is defined as follows:

$$F = \frac{(R_1^2 - R_2^2) / (df_1 - df_2)}{(1 - R_1^2) / (N - df_1)}$$

where: R_1^2 is the RSQ of the full model.

R_2^2 is the RSQ of the restricted model.

df_1 is the degrees of freedom of the full model.

df_2 is the degrees of freedom of the restricted model.

N is the number of subjects.

The probability for accepting the null hypothesis was calculated by the computer for the F value and degrees of freedom. The value was the probability for accepting the two models as being equal representations of the relationship between the criterion and predictor variables.

Each hypothesis of the experiment was stated as a statistical hypothesis and the latter was represented by linear regression models. Model ninety-nine represented a relationship with no predictors and an RSQ of 0.0. The models representing the statistical hypotheses were compared by computer program MULRO4, and the results formed the basis for the conclusions derived from the analysis of test data.

Variables Used in the Analysis

Each variable that was used in regression models to analyze the test results was represented by the letter X and a number, e.g. X_3 represented the variable, IQ. The variables used in the analysis of results are listed in Table V on the following page.

Summary

Resource materials were assembled and lessons for teaching critical thinking in grade six social studies were constructed. No appropriate published standardized tests were available; tests of critical thinking in social studies and social studies achievement were constructed to test the effectiveness of the lessons. Part I

TABLE V

VARIABLES USED IN THE ANALYSIS OF TEST RESULTS

X_1 = boy if 1, otherwise zero

X_2 = girl if 1, otherwise zero

X_3 = verbal intelligence quotient (IQ)

X_4 = experimental group if 1, otherwise 0

X_5 = control group if 1, otherwise 0

X_6 = pre-test score on the Cornell Critical Thinking Test

X_7 = pre-test score on the Critical Thinking in Social Studies Test

X_8 = pre-test score on the social studies achievement test

X_9 = post-test score on the Cornell Critical Thinking Test

X_{10} = post-test score on the Critical Thinking in Social Studies Test

X_{11} = post-test score on the social studies achievement test

X_{12} = $X_4 * X_3$

X_{13} = $X_5 * X_3$

X_{14} = $X_1 * X_3$

X_{15} = $X_2 * X_3$

X_{16} = $X_9 - X_6$

X_{17} = $X_{10} - X_7$

X_{18} = $X_{11} - X_8$

NOTE: * represents multiplication.

of the experimental edition of the Cornell Critical Thinking Test, Level X was used to measure the application of critical thinking skills. A preliminary trial of the resource materials and the first lessons by a social studies teacher in two grade six classrooms yielded encouraging results.

Four experimental and four control classes in a city school district participated in the study. The resource materials were used for a period of seven weeks in May and June of 1969 by both experimental and control group classes. The experimental group teachers used the prepared lessons which emphasized the utilization of the resource materials according to a model for critical thinking in social studies. The control group teachers proceeded with their regular classroom procedures; they did not receive the guides containing the lessons. An outline suggesting general purposes and an order of presenting the resource materials was given to the control group teachers.

The Critical Thinking in Social Studies Test, the social studies achievement test, and the Cornell Critical Thinking test were administered as pre- and post-tests by the writer using identical procedures for the two occasions. Linear regression analysis with the MULRO4 computer program was used exclusively to analyze the test results.

CHAPTER IV

RESULTS OF THE EXPERIMENT

This chapter presents the results of the experiment as derived from the analysis of test data. The results of the teacher questionnaire are included to provide a description of the classroom use of the lessons.

I. RESULTS OF THE ANALYSIS OF TEST DATA

Introduction

The test results were analyzed to provide findings pertinent to the investigation of the eleven hypotheses postulated in the introductory chapter. Before each hypothesis could be investigated it was re-stated in terms of test results and this statistical hypothesis was represented by linear regression models. The statistical conclusions derived from the regression analysis using these models provided the basis for decisions concerning the research hypotheses being investigated.

Table VI on the following page was included to provide an overview of the interrelationships between the variables and to provide statistics to be referred to when checking assumptions underlying linear regression analysis. The intercorrelations of IQ and test scores are significant at the .01 level. The significant correlations between all tests and IQ suggest that IQ is a factor in the relationships between tests. Partialling out techniques were employed in the analysis of the relationships between variables to

TABLE VI

INTERCORRELATIONS AMONG VARIABLES
FOR THE SAMPLE AND SUB-GROUPS

	X ₃	X ₆	X ₇	X ₈	X ₉	X ₁₀	X ₁₁
X ₃	*1.00 **1.00 ***1.00	0.49 0.52 0.46	0.54 0.59 0.47	0.47 0.52 0.39	0.47 0.46 0.51	0.60 0.57 0.62	0.52 0.56 0.47
X ₆		*1.00 **1.00 ***1.00	0.40 0.38 0.41	0.37 0.24 0.49	0.58 0.55 0.62	0.48 0.45 0.50	0.40 0.40 0.41
X ₇			*1.00 **1.00 ***1.00	0.46 0.43 0.49	0.45 0.47 0.46	0.74 0.77 0.70	0.57 0.53 0.60
X ₈				*1.00 **1.00 ***1.00	0.35 0.26 0.48	0.48 0.44 0.50	0.61 0.69 0.53
X ₉					*1.00 **1.00 ***1.00	0.54 0.48 0.62	0.46 0.42 0.50
X ₁₀						*1.00 **1.00 ***1.00	0.65 0.59 0.69
X ₁₁							*1.00 **1.00 ***1.00
X ₃ Verbal IQ X ₆ Cornell Critical Thinking pre-test scores X ₇ Critical Thinking in Social Studies pre-test scores X ₈ Social studies achievement pre-test scores X ₉ Cornell Critical Thinking post-test scores X ₁₀ Critical Thinking in Social Studies post-test scores X ₁₁ Social studies achievement post-test scores							

* Row of correlation coefficients for the sample (N = 231)

** Row of correlation coefficients for the experimental group (N = 122)

*** Row of correlation coefficients for the control group (N = 109)

better determine the existence of significant fundamental relationships.

The Difference Between the Experimental Group and the Control Group in the Development of Critical Thinking in Social Studies

Hypothesis One stated that there was no significant difference between the experimental group and the control group in the development of critical thinking in social studies. Before analyzing the data, Hypothesis One was re-stated in terms of test results. Thus, it was postulated that there was no difference between the experimental group and the control group on the Critical Thinking in Social Studies post-test when adjustments were made for the pre-test and IQ. With adjustments for the pre-test, the post-test was accepted as an indication of the development of critical thinking in social studies.

Before proceeding with an analysis of the difference, basic statistical assumptions were checked for this hypothesis as was done for others concerned with group differences. In the analysis of regression, when adjustments were made for IQ, it was necessary to determine if a linear relationship existed between post-test scores and IQ, and if homogeneity of regression existed for the two groups. These were checked by reference to the correlation coefficients in Table VI, by graphing representative samples of the data, and by the use of regression models with variables representing interaction. These procedures were applied in the investigation of Hypotheses One, Two, Three, Nine, Ten, and Eleven.

The correlation of 0.60 (Table VI) between IQ and the Critical Thinking in Social Studies post-test scores indicated that a significant relationship existed between the two variables. The regression between IQ and the Critical Thinking in Social Studies

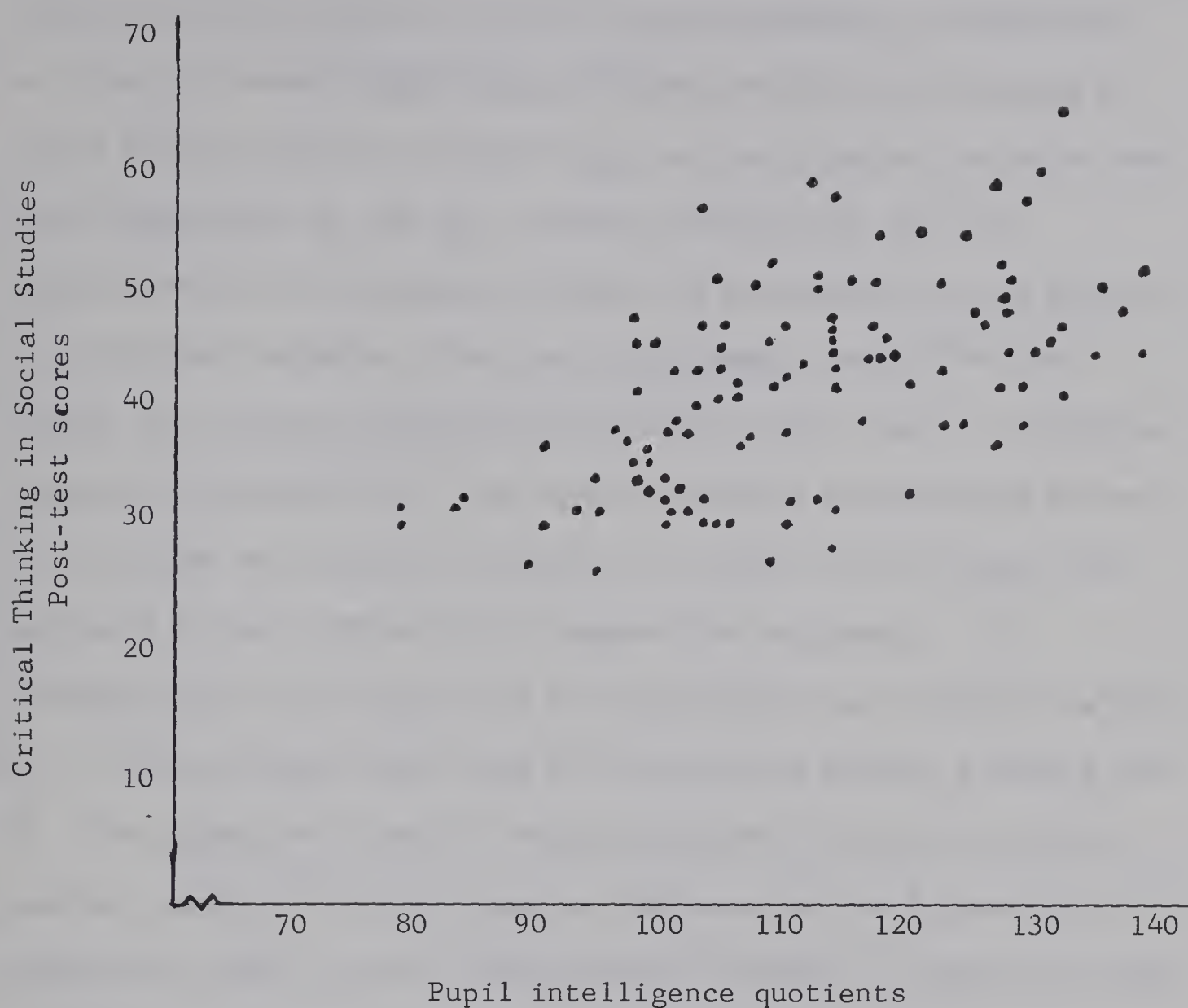


FIGURE I

GRAPH OF CRITICAL THINKING IN SOCIAL STUDIES
POST-TEST SCORES VERSUS PUPIL IQ
IN THE EXPERIMENTAL GROUP

post-test scores was checked for linearity by plotting the experimental group scores as shown in Figure I. This was a representative graph, and, as such, depicted the relationships that existed between IQ and other post-test scores.

Rather than assume homogeneity of regression the data were analyzed to determine the significance of the interaction between

grouping and IQ. Tables VII and VIII (pp. 77-78) contained the models and results from the analysis used for the investigation of Hypothesis One. The Full Model, Number One, consisted of Critical Thinking in Social Studies post-test scores (X_{10}) as the criterion variable, and group membership (X_4 and X_5), pre-test scores (X_7), and the representations of interaction between IQ and group (X_{12} and X_{13}) as the predictor variables. The Restricted Model, Number Two, was similar but contained the IQ (X_3) variable rather than the variables representing interaction. The squared multiple correlations between the criterion and predictor variables for Model One and Model Two were used in the calculation to compare the two models. In accordance with the results the null hypothesis was rejected ($p < .05$), and it was concluded that there was interaction between grouping and IQ. The regression lines for the experimental and control groups were not parallel and the slopes as indicated by the X_{12} and X_{13} weights for Model One were significantly different. Regression lines with different slopes indicated the presence of a crossover and made it unlikely that in the sample there would be a significant difference between the experimental group and the control group.

The two regression lines were graphed in Figure II to illustrate the findings reported in the previous paragraph. The predicted experimental group regression line was plotted with co-ordinates obtained from the following formula:

$$\hat{Y}_4 = A_0 + A_4 + A_7X_7 + A_{12}X_3$$

Values of $\hat{Y}_4$ (predicted Critical Thinking in Social Studies post-test scores) were computed for selected values of X_3 (IQ scores). The computer weights for the A coefficients of Model One and the sample

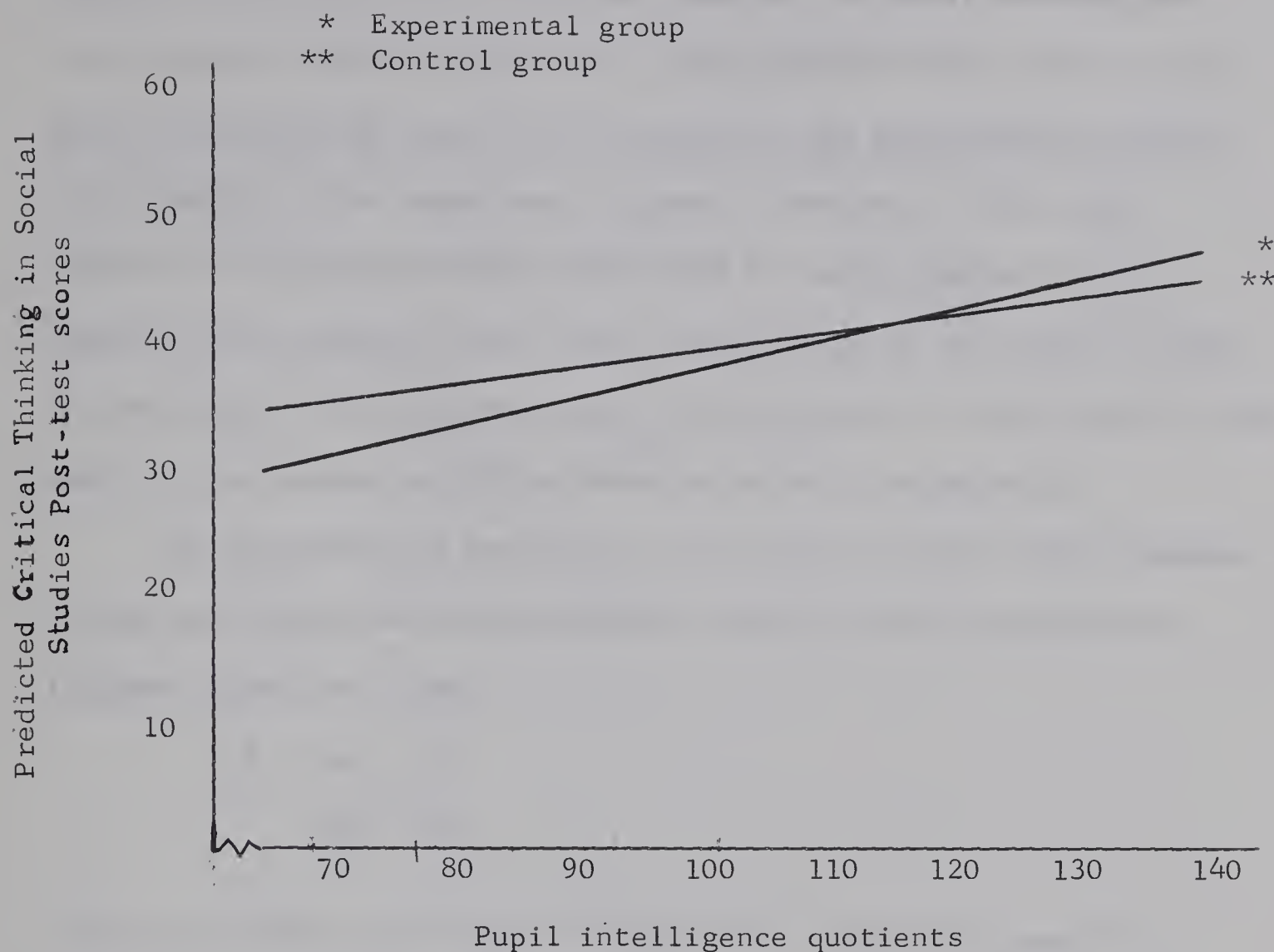


FIGURE II

GRAPH OF REGRESSION LINES FOR PUPIL IQ VERSUS
PREDICTED CRITICAL THINKING IN SOCIAL
STUDIES POST-TEST SCORES

mean of X_7 were used in the calculations. Similarly, the predicted control group regression line was plotted with co-ordinates derived from the following formula:

$$\hat{Y}_5 = A_0 + A_5 + A_7 X_7 + A_{13} X_3$$

Values for $\hat{Y}_5$ were obtained using assumed values for X_3 , the mean for X_7 , and the appropriate A coefficients from Model One.

In Figure II the crossover of the two regression lines for

the experimental and control groups illustrates how the difference between the groups on the Critical Thinking in Social Studies post-test reverses when IQ equals 115. The subjects in the control group with an IQ score of over 115 did better on the post-test than their counterparts in the experimental group. Contrary to this, the subjects of the experimental group with IQ scores below 115 did better on the post-test than their counterparts in the control group. The majority of the subjects would have IQ scores of less than 115; the mean for the sample is 110 as shown in Table IV on page 62.

To determine more precisely the IQ score at which the crossover of the two regression lines occurred, the following formula from Flathman (1968) was used:

$$X_3 = \frac{A_5 - A_4}{A_{12} - A_{13}}$$

Using the coefficient weights of Model One (Table VII--page 77), X_3 (IQ) was computed to be 114.9 at the crossover point. This supported the graphic presentation in Figure II.

Further analysis was performed to determine if the differences on either side of the crossover point were significant. The data from subjects with an IQ score of 115 or greater ($N = 88$) were used with Model Two (Full) and Model Three (Restricted) to determine the significance of group membership as a predictor of post-test scores. In the full model the criterion variable was Critical Thinking in Social Studies post-test scores (X_{10}), and the predictor variables were IQ (X_3), group membership (X_4 and X_5), and pre-test scores (X_7). The restricted model had the constraint of

TABLE VII

LINEAR REGRESSION MODELS ONE TO THREE

Model number	Criterion variable	Computer weights and predictor variables	Squared multiple correlation	Degrees of freedom
1	$X_{10} =$	$-11.69U + 10.34X_4 + 0.0X_5 + 0.68X_7 + 0.15X_{12} + 0.24X_{13} + e$	0.612	5
2	$X_{10} =$	$-5.85U + 0.19X_3 + 0.28X_4 + 0.0X_5 + 0.68X_7 + e$	0.605	4
*2	$X_{10} =$	$6.01U + 0.12X_3 + -1.24X_4 + 0.0X_5 + 0.62X_7 + e$	0.405	4
*3	$X_{10} =$	$7.43U + 0.11X_3 + 0.62X_7 + e$	0.398	3
**2	$X_{10} =$	$-9.70U + 0.21X_3 + 1.28X_4 + 0.0X_5 + 0.70X_7 + e$	0.505	4
**3	$X_{10} =$	$-9.58U + 0.22X_3 + 0.71X_7 + e$	0.499	3
***2	$X_{10} =$	$-10.94U + 0.21X_3 + 1.74X_4 + 0.0X_5 + 0.75X_7 + e$	0.518	4
***3	$X_{10} =$	$-11.29U + 0.22X_3 + 0.76X_7 + e$	0.505	3

* Includes only those subjects with an IQ score of 115 or higher
(N = 88)

** Includes only those subjects with an IQ score of 114 or lower
(N = 143)

*** Includes only those subjects with an IQ score of 105 or lower
(N = 88)

TABLE VIII
COMPARISON OF LINEAR REGRESSION
MODELS ONE TO THREE

Models compared	Degrees of freedom numerator denominator		F ratio	Probability
1 and 2	1	226	4.115	0.044
*2 and 3	1	84	1.097	0.298
**2 and 3	1	139	1.631	0.204
***2 and 3	1	84	2.174	0.144

- * Includes only those subjects with an IQ score of 115 or greater
(N = 88)
- ** Includes only those subjects with an IQ score of 114 or less
(N = 143)
- *** Includes only those subjects with an IQ score of 105 or less
(N = 88)

not having group membership variables. The results of the comparison of the two models (Table VIII) indicated acceptance of the null hypothesis ($p > .05$). Therefore it was concluded that for subjects with IQ scores of 115 or greater there was no significant difference between the experimental and control groups on the Critical Thinking in Social Studies post-test when adjustments were made for the pre-test and IQ.

The data from subjects with an IQ score of 114 or less (N = 143) were used with Model Two (Full) and Model Three (Restricted) which contained criterion and predictor variables as listed in the previous paragraph. The null hypothesis was accepted ($p > .05$) and it

was concluded that for the subjects with an IQ score of 114 or less there was no significant difference between the experimental and control groups on the Critical Thinking in Social Studies post-test when adjustments were made for the pre-test and IQ.

According to Figure II on page 75 the difference between the experimental and control groups appeared greatest for subjects with low IQ scores. In order to retain a sufficient number of subjects for further analysis of the difference between groups, the data of subjects with an IQ score of 105 or less ($N = 88$) were used. Model Two (Full) and Model Three (Restricted) were compared to determine if the grouping variables were significant predictors, that is, a significant difference existed between the two groups. The computer results (Table VIII) indicated acceptance of the null hypothesis ($p > .05$). Therefore it was concluded that for subjects with an IQ score of 105 or less there was no significant difference between the experimental and control groups on the Critical Thinking in Social Studies post-test when adjustments were made for the pre-test and IQ.

The failure to find significant differences between the experimental and control groups at different IQ levels is understandable; the level of significant interaction between grouping and IQ was low ($p < .05$). A more significant interaction would have resulted in a greater difference between the slopes of the two regression lines (Figure II), and a greater difference between groups on either side of the crossover point. As a result of the above analysis, it was concluded that there was no significant difference between the experimental group and the control group on the Critical Thinking in Social Studies post-test when adjustments were made for the pre-test and IQ.

On the basis of the analysis of test results it was concluded that there was no significant difference between the experimental group and the control group in the development of critical thinking in social studies. The experimental group, which used the prepared lessons emphasizing a model for critical thinking, did not achieve a greater development of critical thinking in social studies than a control group using the same resource materials without the lessons.

The significant interaction between IQ and grouping indicated that, although in both groups the development of critical thinking in social studies was related to IQ, the two relationships were not the same. The instruction given in the experimental group did not produce the same results for each ability level (IQ) as that attained at these levels of ability in a control group using the same resource materials. Relative to a control group, the pupils of low or average ability showed a tendency to greater achievement in critical thinking in social studies when instructed as they were in the experimental group. For the pupils at the different ability levels the tendency indicated by the significant interaction did not result in statistically significant differences between the experimental and control groups.

The Difference Between the Experimental Group and the Control Group in the Development of Critical Thinking

Hypothesis Two stated that there was no significant difference between the experimental group and the control group in the development of critical thinking. In order to investigate Hypothesis Two by means of an analysis of test data, it was restated in statistical terms. It was postulated that there was no difference between the experimental group and the control group on the Cornell Critical Thinking post-test

when adjustments were made for the pre-test and pupil IQ. With adjustment for the pre-test, the post-test was accepted as an indication of the development of critical thinking.

A correlation of 0.47 between pupil IQ and Cornell post-test scores (Table VI) indicated that a relationship existed between the Cornell post-test and IQ. The relationship was linear and its regression line was suitably represented by Figure I on page 73.

The models and computer results of the analysis concerning Hypothesis Two are contained in Tables IX and X on page 82.

The data ~~were~~ checked for homogeneity of regression, that is, ~~they were~~ analyzed to determine if a significant interaction existed between grouping and IQ. The full model, Number Four, consisted of Cornell post-test scores (X_9) as the criterion variable, and group membership (X_4 and X_5), pre-test scores (X_6), and the representation of interaction between IQ and group (X_{12} and X_{13}) as the predictor variables. It was compared to the restricted model, Number Five, which was similar but contained the IQ variable (X_3) rather than the variables representing interaction. The calculated probability ($p > .05$) indicated acceptance of the null hypothesis that the restricted model fitted the data as well as the full model. Therefore, it was concluded that there was no significant interaction between IQ and grouping, that is, the regression lines for the two groups were parallel. This meant that the slopes of the two lines as indicated by the computer weights for X_{12} and X_{13} did not differ significantly.

Model Five was then used as the full model and was compared with Model Six to determine if the group membership variables X_4 and

TABLE IX
LINEAR REGRESSION MODELS FOUR TO SIX

Model number	Criterion variable	Computer weights and predictor variables	Squared multiple correlation	Degrees of freedom
4	$X_9 =$	$3.16U + 0.06X_4 + 0.0X_5 + 0.46X_6 + 0.09X_{12} + 0.10X_{13} + e$	0.390	5
5	$X_9 =$	$3.62U + 0.10X_3 + -0.78X_4 + 0.0X_5 + 0.46X_6 + e$	0.389	4
6	$X_9 =$	$3.69U + 0.09X_3 + 0.46X_6 + e$	0.383	3

TABLE X
COMPARISON OF LINEAR REGRESSION
MODELS FOUR TO SIX

Models compared	Degrees of freedom		F ratio	Probability
	numerator	denominator		
4 and 5	1	226	0.148	0.701
5 and 6	1	227	2.227	0.137

X_5 were significant as predictors. The restricted model (Model Six) contained IQ and pre-test scores as predictor variables as did the full model but did not contain group membership variables. The results of the analysis indicated acceptance ($p > .05$) of the null hypothesis that grouping was insignificant as a predictor of post-test scores. Therefore, it was concluded that there was no significant difference between the experimental and control groups on the Cornell Critical Thinking post-test when adjustments were made for the pre-test and IQ.

On the basis of the analysis of test results it was concluded that there was no difference between the experimental group and the control group in the development of critical thinking. The experimental group, which used the prepared lessons, did not achieve a greater development of critical thinking than a control group using the same resource materials without the lessons.

The Difference Between the Experimental Group and the Control Group in Social Studies Achievement

Hypothesis Three stated that there was no significant difference between the experimental group and the control group in social studies achievement. Social studies achievement comprised the knowledge of facts and understandings derived from the resource materials used by both groups. Re-stated in terms of test results, Hypothesis Three postulated that there was no significant difference between the experimental group and the control group on the social studies achievement post-test when adjustments were made for the pre-test and IQ. It was accepted that, when adjustments were made for the pre-test, the post-test indicated social studies achievement.

Using procedures identical to those above, the data were analyzed to determine the difference between the experimental group and the control group in social studies achievement. The models and results were summarized in Tables XI and XII on the following page.

A significant relationship existed between the social studies achievement post-test scores and the co-variate, IQ scores; the correlation between the social studies achievement post-test and IQ scores was linear and adequately represented by Figure I. Therefore it was accepted that a linear relationship existed between IQ and post-test scores as required for the statistical analysis employed in determining the significance of the difference between groups.

Model Seven (Full) and Model Eight (Restricted) were used to represent interaction between grouping and IQ, and no interaction, respectively. The full model contained social studies achievement post-test scores (X_{11}) as the criterion variable, and group membership (X_4 and X_5), pre-test (X_8), and the representation of interaction between IQ and grouping (X_{12} and X_{13}) as the predictor variables. The condition that the regression lines for the experimental and control groups were parallel was represented by the restricted model with a constraint--the two variables representing interaction were replaced by the IQ variable (X_3). The results of comparing the two models indicated the acceptance of the null hypothesis ($p > .05$). Hence it was concluded that there was no significant interaction between IQ and grouping for social studies achievement post-test scores.

To test for a significant difference between the experimental group and the control group, the data were analyzed for the effects of group membership as a predictor of social studies achievement

TABLE XI
LINEAR REGRESSION MODELS SEVEN TO NINE

Model number	Criterion variable	Computer weights and predictor variables	Squared multiple correlation	Degrees of freedom
7	X_{11}	$= -2.68U + 0.55X_4 + 0.0X_5 + 0.65X_8 + 0.14X_{12} + 0.15X_{13} + e$	0.446	5
8	X_{11}	$= -2.24U + 0.14X_3 + -0.14X_4 + 0.0X_5 + 0.65X_8 + e$	0.445	4
9	X_{11}	$= -2.24U + 0.14X_3 + 0.65X_8 + e$	0.445	3

TABLE XII
COMPARISON OF LINEAR REGRESSION MODELS
SEVEN TO NINE

Models compared	Degrees of freedom		F ratio	Probability
	numerator	denominator		
7 and 8	1	226	0.114	0.736
8 and 9	1	227	0.049	0.824

post-test scores. The full model, Model Eight, was compared with Model Nine, the restricted model, which did not contain the group membership variables. The null hypothesis that grouping was not a significant predictor of post-test scores was accepted ($p > .05$), and it was concluded that there was no significant difference between the experimental group and the control group on the social studies achievement post-test when adjustments were made for the pre-test and IQ.

On the basis of the statistical analysis of test results it was concluded that there was no difference between the experimental group and the control group in social studies achievement. The experimental group, which used the lessons emphasizing a model for critical thinking, did not attain greater or less social studies achievement than a control group using the same resource materials with regular classroom instruction.

The Relationship Between Gains in Critical Thinking in Social Studies and IQ

Hypothesis Four stated that there was no significant relationship between gains in critical thinking in social studies and IQ, in either the experimental group or in the control group. Gains on the Critical Thinking in Social Studies Test were accepted as indications of gains in critical thinking in social studies. In terms of test results, it was postulated that there was no significant relationship between gains on the Critical Thinking in Social Studies Test and IQ in either the experimental group or in the control group.

The following analysis was performed to investigate the significance of the relationship. The models and results were placed

in Tables XIII and XIV.

In the experimental group the correlation between IQ and gains on the Critical Thinking in Social Studies Test was 0.07. Regression analysis was employed to determine if the relationship was significant. The full model, Model Ten, contained gains on the Critical Thinking in Social Studies Test (X_{17}) as the criterion variable and IQ (X_3) as the predictor variable. The comparison of the full model and Model Ninety-nine resulted in the acceptance of the null hypothesis ($p > .05$), and it was concluded that in the experimental group there was no significant relationship between IQ and gains on the Critical Thinking in Social Studies Test. Because Model Ninety-nine does not have to be prepared for Program MULRO4 computer analysis and its weights are 0.0, it was not included in Table XIII.

On the basis of the statistical results it was concluded that in the experimental group there was no significant relationship between IQ and gains in critical thinking in social studies.

A correlation of 0.31 indicated that in the control group the relationship between IQ and gains on the Critical Thinking in Social Studies Test was significant at the .01 level. Using procedures identical to those employed with the experimental group, Model Ten and Model Ninety-nine were compared. The null hypothesis was rejected ($p = .001$) and it was concluded that in the control group the relationship was significant.

On the basis of the statistical results it was concluded that in the control group there was a significant relationship between IQ and gains in critical thinking in social studies.

TABLE XIII
LINEAR REGRESSION MODEL TEN

Model number	Criterion variable	Computer weights and predictor variables	Squared multiple correlation	Degrees of freedom
*10	$X_{17} =$	$-0.36U + 0.03X_3 + e$	0.005	2
**10	$X_{17} =$	$-15.28U + 0.17X_3 + e$	0.095	2

* Results from using the model with experimental group data.
 ** Results from using the model with control group data.

TABLE XIV
COMPARISON OF LINEAR REGRESSION MODELS
TEN AND NINETY-NINE

Models compared	Degrees of freedom numerator denominator		F ratio	Probability
*10 and 99	1	120	0.614	0.435
**10 and 99	1	107	11.200	0.001

* Results from using the models with experimental group data.
 ** Results from using the models with control group data.

The above statistical findings revealed an important difference between the experimental group and the control group. In the experimental group which followed the prepared lessons emphasizing the use of prepared resource materials according to a model of critical thinking, there was no significant relationship between IQ and gains in critical thinking in social studies. In the control group, which did not follow the prepared lessons but used the same resource materials with regular classroom instruction, there was a significant relationship between IQ and gains in critical thinking in social studies. This indicated that students made gains in critical thinking in social studies irrespective of ability levels (IQ) when instructed as they were in the experimental group.

The Relationship Between Gains in Critical Thinking and IQ

In Hypothesis Four, it was postulated that there was no significant relationship between IQ and gains in critical thinking in either the experimental group or in the control group. It was accepted that gains on the Cornell Critical Thinking Test indicated gains in critical thinking. Thus, as a guide for the analysis of data, it was hypothesized that there was no significant relationship between gains on the Cornell Critical Thinking Test and IQ.

The linear regression models and the results were placed in Tables XV and XVI on the following page.

In the experimental group a very low negative correlation (-0.02) existed between IQ scores and gains on the Cornell Critical Thinking Test. Nonetheless, the significance of the relationship was checked by regression analysis using Model Eleven (Full) and Model

TABLE XV
LINEAR REGRESSION MODEL ELEVEN

Model number	Criterion variable	Computer weights and predictor variables	Squared multiple correlation	Degrees of freedom
*11	X_{16}	$= 1.44U + 0.0X_3 + e$	0.000	2
**11	X_{16}	$= 1.61U + 0.0X_3 + e$	0.000	2

* Results from using the model with experimental group data.
 ** Results from using the model with control group data.

TABLE XVI
COMPARISON OF LINEAR REGRESSION MODELS
ELEVEN AND NINETY-NINE

Models compared	Degrees of freedom		F ratio	Probability
	numerator	denominator		
*11 and 99	1	120	0.056	0.812
**11 and 99	1	107	0.001	0.971

* Results from using the models with experimental group data.
 ** Results from using the models with control group data.

Ninety-nine. Model Eleven contained gains on the Cornell Critical Thinking Test (X_{16}) as the criterion variable and IQ (X_3) as the predictor variable. As a result of comparing the two models, the null hypothesis of no significant relationship was accepted ($p > .05$). It was concluded that no significant relationship existed between IQ and Cornell Critical Thinking Test gains in the experimental group.

There was no relationship between IQ and Cornell Critical Thinking Test gains in the control group. As an added check the existence of a significant relationship was tested using regression analysis. The models and procedures used with the control group data were identical to those reported in the previous paragraph. The null hypothesis was accepted ($p > .05$); that is, there was no significant relationship between IQ and gains on the Cornell Critical Thinking Test in the control group.

The results of the statistical analysis indicated that, in the experimental group and in the control group, there was no significant relationship between IQ and gains in critical thinking.

The Relationship Between Gains in Social Studies Achievement and IQ

Hypothesis Six postulated that there was no significant relationship between IQ and gains in social studies achievement in either the experimental group or in the control group. Gains on the social studies achievement test were accepted as an indication of gains in social studies achievement. In terms of test results it was postulated that there was no significant relationship between IQ and gains on the social studies achievement test in the experimental group or in the control group. The regression models to statistically represent the hypothesis and the results were included in Tables XVII

TABLE XVII
LINEAR REGRESSION MODEL TWELVE

Model number	Criterion variable	Computer weights and predictor variables	Squared multiple correlation	Degrees of freedom
*12	$X_{18} =$	$-1.12U + 0.07X_3 + e$	0.042	2
**12	$X_{18} =$	$-6.03U + 0.11X_3 + e$	0.063	2

- * Results from using the model with experimental group data.
 ** Results from using the model with control group data.

TABLE XVIII
COMPARISON OF LINEAR REGRESSION MODELS
TWELVE AND NINETY-NINE

Models compared	Degrees of freedom numerator denominator		F ratio	Probability
*12 and 99	1	120	5.301	0.023
**12 and 99	1	107	7.185	0.009

- * Results from using the models with experimental group data.
 ** Results from using the models with control group data.

and XVIII.

In the experimental group there was a correlation of 0.21 between IQ and gains on the social studies achievement test. Model Twelve and Model Ninety-nine were statistically compared to determine the significance of this relationship. In Model Twelve gains on the social studies achievement test (X_{18}) formed the criterion variable and IQ (X_3) was the predictor variable. In accordance with the results, the null hypothesis of no relationship was rejected ($p < .05$), and it was concluded that in the experimental group a significant relationship existed between IQ and gains on the social studies achievement test.

In the control group, IQ was found to correlate at 0.25 with gains on the social studies achievement test. Models and procedures identical to those used with experimental group data were employed to test the significance of the relationship. In accordance with the computer results (Table XVIII) it was concluded that a significant relationship ($p < .01$) existed in the control group between IQ and gains on the social studies achievement test.

On the basis of the analysis of test data it was concluded that a significant relationship existed between IQ and gains in social studies achievement in the experimental group and in the control group. Gains in the knowledge of social studies facts and understandings derived from resource materials was significantly related to pupil ability as measured by IQ. This relationship was significant in both the control group with regular classroom instruction and in the experimental group which used the prepared social studies lessons.

The Relationship Between Social Studies Achievement and the Development of Critical Thinking in Social Studies

Hypothesis Seven stated that, when adjustments were made for IQ, there was no significant relationship between social studies achievement and the development of critical thinking in social studies in the experimental group or in the control group. It was accepted that the social studies achievement post-test indicated social studies achievement when adjustments were made for the pre-test. It was likewise accepted that the Critical Thinking in Social Studies post-test indicated the development of critical thinking in social studies when adjustments were made for the pre-test. Since it was likely that IQ was a common factor in both social studies achievement and the development of critical thinking in social studies, a partialling out technique was employed when investigating the hypothesis. In terms of test results it was postulated that there was no significant relationship between the social studies achievement post-test and Critical Thinking in Social Studies post-test when adjustments were made for IQ and the respective pre-tests.

The data from the experimental group were analyzed to determine the existence of a significant relationship. The models and results were placed in Tables XIX and XX on the following page. Model Thirteen (Full) and Model Fourteen (Restricted) were compared and consequently the null hypothesis was rejected ($p < .01$). Therefore it was concluded that a significant relationship existed in the experimental group between the social studies achievement post-test and the Critical Thinking in Social Studies post-test when adjustments were made for IQ and the respective pre-tests.

TABLE XIX

LINEAR REGRESSION MODELS THIRTEEN AND FOURTEEN

Model number	Criterion variable	Computer weights and predictor variables	Squared multiple correlation	Degrees of freedom
*13	X_{11}	$= -1.27U + 0.06X_3 + 0.03X_7 + 0.61X_8 + 0.20X_{10} + e$	0.586	5
*14	X_{11}	$= -1.17U + 0.07X_3 + 0.17X_7 + 0.64X_8 + e$	0.557	4
**13	X_{11}	$= -0.45U + 0.02X_3 + 0.14X_7 + 0.33X_8 + 0.32X_{10} + e$	0.536	5
**14	X_{11}	$= -4.89U + 0.10X_3 + 0.32X_7 + 0.42X_8 + e$	0.460	4

* Results from using the model with experimental group data.

** Results from using the model with control group data.

TABLE XX

COMPARISON OF LINEAR REGRESSION MODELS
THIRTEEN AND FOURTEEN

Models compared	Degrees of freedom		F ratio	Probability
	numerator	denominator		
*13 and 14	1	117	8.173	0.005
**13 and 14	1	104	16.944	0.000

* Results from using the models with experimental group data.

** Results from using the models with control group data.

Further investigation, using models and procedures identical to those employed with the experimental group data, was carried out with the control group data. The comparison of Model Thirteen (Full) and Model Fourteen (Restricted), as shown in Tables XIX and XX, resulted in the rejection of the null hypothesis ($p < .001$). There was a significant relationship in the control group between the social studies achievement post-test and the Critical Thinking in Social Studies post-test when adjustments were made for IQ and the respective pre-tests.

On the basis of the statistical analysis it was concluded that, when the effects of IQ were partialled out, there was a significant relationship between social studies achievement and the development of critical thinking in social studies, in the experimental group and in the control group. The achieving of a knowledge of social studies facts and understandings was significantly related to the development of critical thinking in social studies.

The Relationship Between Social Studies Achievement and the Development of Critical Thinking

Hypothesis Eight stated that, when adjustments were made for IQ, there was no significant relationship between social studies achievement and the development of critical thinking in the experimental group or in the control group. It was accepted that the Cornell Critical Thinking post-test indicated the development of critical thinking when adjustments were made for the pre-test. Hypothesis Eight was re-stated in terms of test results. It was postulated that there was no significant relationship between the

TABLE XXI
LINEAR REGRESSION MODELS FIFTEEN AND SIXTEEN

Model number	Criterion variable	Computer weights and predictor variables	Squared multiple correlation	Degrees of freedom
*15	$X_{11} =$	$-2.58U + 0.07X_3 + 0.14X_6 + 0.68X_8 + 0.18X_9 + e$	0.565	5
*16	$X_{11} =$	$-1.89U + 0.08X_3 + 0.23X_6 + 0.69X_8 + e$	0.550	4
**15	$X_{11} =$	$-4.45U + 0.12X_3 + -0.01X_6 + 0.51X_8 + 0.32X_9 + e$	0.400	5
**16	$X_{11} =$	$-4.08U + 0.15X_3 + 0.11X_6 + 0.57X_8 + e$	0.372	4

* Results from using the model with experimental group data.
 ** Results from using the model with control group data.

TABLE XXII
COMPARISON OF LINEAR REGRESSION MODELS
FIFTEEN AND SIXTEEN

Models compared	Degrees of freedom numerator denominator		F ratio	Probability
*15 and 16	1	117	4.022	0.047
**15 and 16	1	104	5.005	0.027

* Results from using the models with experimental group data.
 ** Results from using the models with control group data.

social studies achievement post-test and the Cornell Critical Thinking post-test when adjustments were made for IQ and the respective pre-tests.

The test results for the experimental group were analyzed to determine the existence of a significant relationship. The linear regression models and results were placed in Tables XXI and XXII on page 97. Model Fifteen (Full) and Model Sixteen (Restricted) were compared, and the null hypothesis was rejected ($p < .05$). It was concluded that in the experimental group a significant relationship existed between the social studies achievement post-test and the Cornell Critical Thinking post-test when adjustments were made for IQ and the respective pre-tests.

The control group test results were also analyzed to determine if there was a significant relationship. As shown in Tables XXI and XXII the same models were compared for the control group with similar results. There was a significant relationship ($p < .05$) in the control group between the social studies achievement post-test and the Cornell Critical Thinking post-test when adjustments were made for IQ and the respective pre-tests.

On the basis of the statistical analysis of test results it was concluded that, when the effects of IQ were partialled out, there was a significant relationship between social studies achievement and the development of critical thinking, in the experimental group and in the control group. The achievement of knowledge of social studies facts and understandings was related to the development of critical thinking.

The Difference Between Boys and Girls in the Development of Critical Thinking in Social Studies

Hypothesis Nine stated that there was no significant difference

between boys and girls in the development of critical thinking in social studies in the experimental group or in the control group. It was accepted that the development of critical thinking in social studies was indicated by the Critical Thinking in Social Studies post-test when adjustments were made for the pre-test. The hypothesis was re-stated in terms of test results. It was postulated that there was no significant difference between boys and girls on the Critical Thinking in Social Studies post-test when adjustments were made for the pre-test and IQ.

The above statistical hypothesis was investigated with data from the experimental group. The models and results were placed in Tables XXIII and XXIV on the following page.

As shown in Table VI on page 71 the correlation between IQ and Critical Thinking in Social Studies post-test scores was found to be 0.57. The linearity of the regression line was adequately represented by Figure I on page 73. Therefore it was accepted that a linear relationship existed between IQ and Critical Thinking in Social Studies post-test scores.

The interaction between IQ and sex was analyzed to determine if homogeneity of regression existed for boys and girls. Model Seventeen (Full) and Model Eighteen (Restricted) were similar except for a constraint in the latter; the IQ variable replaced the variables (X_{14} and X_{15}) representing interaction. Subsequent to a statistical comparison of the two models (Table XXIV), the null hypothesis was accepted ($p < .05$). It was concluded that there was no significant interaction between sex and IQ and that the two regression lines were parallel.

TABLE XXIII
LINEAR REGRESSION MODELS SEVENTEEN TO NINETEEN

Model number	Criterion variable	Computer weights and predictor variables	Squared multiple correlation	Degrees of freedom
*17	$X_{10} =$	$-4.32U + 6.94X_1 + 0.0X_2 + 0.74X_7 + 0.10X_{14} + 0.15X_{15} + e$	0.623	5
*18	$X_{10} =$	$-0.32U + 0.84X_1 + 0.0X_2 + 0.11X_3 + 0.75X_7 + e$	0.619	4
*19	$X_{10} =$	$0.24U + 0.11X_3 + 0.75X_7 + e$	0.617	3
**17	$X_{10} =$	$-13.18U + 0.0X_1 + 0.0X_2 + 0.61X_7 + 0.29X_{14} + 0.27X_{15} + e$	0.602	5
**18	$X_{10} =$	$-13.90U + 1.26X_1 + 0.0X_2 + 0.28X_3 + 0.61X_7 + e$	0.602	4
**19	$X_{10} =$	$-13.00U + 0.27X_3 + 0.62X_7 + e$	0.598	3

* Results from using the model with experimental group data.

** Results from using the model with control group data.

TABLE XXIV
COMPARISON OF LINEAR REGRESSION MODELS
SEVENTEEN TO NINETEEN

Models compared	Degrees of freedom numerator denominator		F ratio	Probability
*17 and 18	1	117	1.280	0.260
*18 and 19	1	118	0.710	0.401
**17 and 18	1	104	-0.058	1.000
**18 and 19	1	105	1.129	0.290

* Results from using the models with experimental group data.

** Results from using the models with control group data.

The probability for accepting the null hypothesis of no difference between boys and girls was determined by comparing Model Eighteen as the full model with Model Nineteen, the restricted model. Model Nineteen was restricted by the omission of the sex membership variables (X_1 and X_2). In accordance with the results (Table XXIV) the null hypothesis was accepted ($p > .05$), and it was concluded that in the experimental group there was no significant difference between boys and girls on the Critical Thinking in Social Studies post-test when adjustments were made for the pre-test and IQ.

The statistical hypothesis was investigated using data from the control group and with procedures identical to those employed with the experimental group data. Models Seventeen, Eighteen, and Nineteen were used to check for homogeneity of regression and for a significant difference between boys and girls. There was no significant interaction between IQ and sex ($p > .05$), and the null hypothesis of no significant difference between boys and girls was accepted ($p > .05$). It was therefore concluded that in the control group there was no significant difference between boys and girls on the Critical Thinking in Social Studies post-test when adjustments were made for the pre-test and IQ.

On the basis of the statistical analysis of test results it was concluded that there was no significant difference between boys and girls in the development of critical thinking in social studies, in the experimental group or in the control group.

The Difference Between Boys and Girls in the Development of Critical Thinking

Hypothesis Ten stated that there was no significant difference

between boys and girls in the development of critical thinking in the experimental group or in the control group. It was accepted that the development of critical thinking was indicated by the Cornell Critical Thinking post-test when adjustments were made for the pre-test. In terms of test results it was postulated that there was no significant difference between boys and girls on the Cornell Critical Thinking post-test when adjustments were made for the pre-test and IQ.

The hypothesis was investigated using experimental group test results. The linear regression models and results were placed in Tables XXV and XXVI on the following page. A correlation of 0.46 (Table VI) existed between the Cornell Critical Thinking post-test scores and IQ, and the linearity of the relationship was satisfactorily represented by Figure I on page 73. To test for homogeneity of regression Model Twenty (Full) and Model Twenty-One (Restricted) of Table XXV were compared. The null hypothesis was accepted ($p > .05$), and it was concluded that there was no significant interaction between grouping and IQ; that is, the two regression lines for boys and girls in the experimental group were parallel.

Model Twenty-one was used as the full model and compared with Model Twenty-two (Restricted) to determine if there was a significant difference between boys and girls. The null hypothesis was accepted ($p > .05$), and it was concluded that there was no significant difference in the experimental group between boys and girls on the Cornell Critical Thinking post-test when adjustments were made for the pre-test and IQ.

The hypothesis was investigated using control group test results. The same models and statistical procedures were employed as

TABLE XXV

LINEAR REGRESSION MODELS TWENTY TO TWENTY-TWO

Model number	Criterion variable	Computer weights and predictor variables	Squared multiple correlation	Degrees of freedom
*20	X_9	$= -0.07U + 6.41X_1 + 0.0X_2 + 0.45X_6 + 0.07X_{14} + 0.12X_{15} + e$	0.350	5
*21	X_9	$= 3.71U + 0.06X_1 + 0.0X_2 + 0.09X_3 + 0.47X_6 + e$	0.341	4
*22	X_9	$= 3.75U + 0.09X_3 + 0.47X_6 + e$	0.341	3
**20	X_9	$= 0.71U + 2.47X_1 + 0.0X_2 + 0.43X_6 + 0.11X_{14} + 0.12X_{15} + e$	0.457	5
**21	X_9	$= 1.64U + 1.03X_1 + 0.0X_2 + 0.11X_3 + 0.43X_6 + e$	0.456	4
**22	X_9	$= 2.41U + 0.11X_3 + 0.45X_6 + e$	0.446	3

* Results from using the model with experimental group data.

** Results from using the model with control group data.

TABLE XXVI

COMPARISON OF LINEAR REGRESSION MODELS TWENTY TO TWENTY-TWO

Models compared	Degrees of freedom		F ratio	Probability
	numerator	denominator		
*20 and 21	1	117	1.527	0.219
*21 and 22	1	118	0.006	0.937
**20 and 21	1	104	0.252	0.617
**21 and 22	1	105	1.955	0.165

* Results from using the models with experimental group data.

** Results from using the models with control group data.

was done with the experimental group data. The models and statistical results were reported in Tables XXV and XXVI. The null hypotheses concerning the interaction between IQ and sex and the difference between boys and girls were accepted ($p > .05$). It was therefore concluded that in the control group there was no difference between boys and girls on the Cornell Critical Thinking post-test when adjustments were made for the pre-test and IQ.

On the basis of the statistical analysis of test results, it was concluded that there was no significant difference between boys and girls in the development of critical thinking in the experimental group or in the control group.

The Difference Between Boys and Girls in Social Studies Achievement

Hypothesis Eleven postulated that there was no significant difference between boys and girls in social studies achievement in the experimental group or in the control group. It was accepted that the social studies achievement post-test indicated social studies achievement when adjustments were made for the pre-test. In terms of test results it was postulated that there was no significant difference between boys and girls on the social studies achievement post-test when adjustments were made for the pre-test and IQ.

The experimental group test results were used to investigate Hypothesis Eleven. The linear regression models and the results were placed in Tables XXVII and XXVIII on the following page.

As shown in Table VI on page 71 the correlation between IQ and the social studies achievement post-test scores was 0.56. The linearity of the relationship was adequately portrayed by Figure I on page 73. Therefore it was accepted that a linear relationship existed

TABLE XXVII

LINEAR REGRESSION MODELS TWENTY-THREE TO TWENTY-FIVE

Model number	Criterion variable	Computer weights and predictor variables	Squared multiple correlation	Degrees of freedom
*23	$X_{11} =$	$-1.46U + 1.00X_1 + 0.0X_2 + 0.68X_8 + 0.12X_{14} + 0.13X_{15} + e$	0.528	5
*24	$X_{11} =$	$-0.98U + 0.18X_1 + 0.0X_2 + 0.12X_3 + 0.68X_8 + e$	0.527	4
*25	$X_{11} =$	$-0.87U + 0.12X_3 + 0.68X_8 + e$	0.527	3
**23	$X_{11} =$	$-6.81U + 4.55X_1 + 0.0X_2 + 0.62X_8 + 0.15X_{14} + 0.19X_{15} + e$	0.372	5
**24	$X_{11} =$	$-4.60U + 0.76X_1 + 0.0X_2 + 0.17X_3 + 0.61X_8 + e$	0.369	4
**25	$X_{11} =$	$-4.09U + 0.16X_3 + 0.63X_8 + e$	0.366	3

* Results from using the model with experimental group data.

** Results from using the model with control group data.

TABLE XXVIII

COMPARISON OF LINEAR REGRESSION MODELS
TWENTY-THREE TO TWENTY-FIVE

Models compared	Degrees of freedom		F ratio	Probability
	numerator	denominator		
*23 and 24	1	117	0.143	0.706
*24 and 25	1	118	0.056	0.814
**23 and 24	1	104	0.456	0.501
**24 and 25	1	105	0.500	0.481

* Results from using the models with experimental group data.

** Results from using the models with control group data.

between IQ and social studies achievement post-test scores.

The two regression lines for boys and girls were checked for homogeneity of regression by comparing Model Twenty-three (Full) and Model Twenty-four (Restricted). The null hypothesis was accepted ($p > .05$), that is, there was no significant interaction between sex and IQ, and the two regression lines were parallel.

To determine the probability of accepting the null hypothesis of no significant difference between boys and girls, Model Twenty-four, the full model, was compared with Model Twenty-five, the restricted model. The null hypothesis was accepted ($p > .05$), and it was concluded that in the experimental group there was no significant difference between boys and girls on the social studies achievement post-test when adjustments were made for the pre-test and IQ.

Using data from the control group the statistical hypothesis was investigated with regression analysis identical to that used for the experimental group. The comparison of Model Twenty-three (Full) and Model Twenty-four (Restricted) indicated that there was no significant interaction between IQ and sex ($p > .05$). The models and results were placed in Tables XXVII and XXVIII. As a result of comparing Models Twenty-four (Full) and Twenty-five (Restricted), it was concluded ($p > .05$) that in the control group there was no significant difference between boys and girls on the social studies achievement post-test when adjustments were made for the pre-test and IQ.

On the basis of the statistical analysis of test data, it was concluded that there was no significant difference between boys and girls in social studies achievement in the experimental group or in the control group.

II. TEACHER EVALUATION OF THE LESSONS

The Evaluation Questionnaire

Each of the four teachers of the experimental group classes completed a questionnaire on the appropriateness of the lessons and resource materials for developing critical thinking in social studies. Teachers added comments on their success in using the lessons and on applying the simplified model of critical thinking in social studies.

The lack of objective standards for the teacher ratings limited the interpretation of the results. The results were essentially descriptive and indicated how successfully the lessons, in the opinion of the teachers, were used in the experimental group classrooms. The results of the questionnaire suggest that certain procedures were carried out, but do not, with any certainty, indicate the degree to which skills were developed.

In the copy of the evaluation questionnaire included below, the numbers on the right indicate the total number of lessons that four teachers rated in each evaluation category. The results yield only rough proportions since some teachers failed to report all lessons.

EVALUATION OF THE LESSONS

TEACHER'S NAME
SCHOOL

1. Were the children interested in the lessons?

- | | |
|---|------|
| a. very interested in Lessons numbered . . . | (27) |
| b. moderately interested in Lessons | (46) |
| c. not interested in Lessons | (12) |

2. How much discussion did the lessons stimulate? The lessons stimulated:
 - a. much discussion in Lessons . . . (34)
 - b. some discussion in Lessons . . . (47)
 - c. very little discussion in Lessons . . . (11)
3. How suitable were the lessons for the class as a whole?
 - a. Lessons . . . were too hard. (11)
 - b. Lessons . . . were about right. (66)
 - c. Lessons . . . were too easy. (10)
4. To which ability groups were the lessons best suited?
 - a. Lessons . . . were best suited to the upper group. (29)
 - b. Lessons . . . were best suited to the average group. (46)
 - c. Lessons . . . were best suited to the lower group. (5)
5. Were the children able to derive appropriate facts and understandings from the slides?

The children accomplished this:

 - a. easily in Lessons . . . (38)
 - b. with some difficulty in Lessons . . . (26)
 - c. with much difficulty in Lessons . . . (21)
6. Were the children able to derive appropriate facts and understandings from the student Resource Booklets?

The children accomplished this:

 - a. easily in Lessons . . . (41)
 - b. with some difficulty in Lessons . . . (20)
 - c. with much difficulty in Lessons . . . (13)
7. Was the student model of critical thinking in social studies successfully applied in the lessons?

The model was:

 - a. very successfully applied in Lessons . . . (29)
 - b. applied with moderate success in Lessons . . . (45)
 - c. unsuccessfully applied in Lessons . . . (13)
8. Have the critical thinking skills taught in social studies transferred to other situations in the classroom?
 - a. Many instances of this have been noticed. (1)
 - b. Some instances of this have been noticed. (3)
 - c. No instances of this have been noticed. (0)
9. Comments:

Please add a written evaluation of the social studies lessons, resource materials, and the use of the student model for critical thinking in social studies.

A comparison of the numbers of the lessons classified under the choices for each question gave an indication of how well the suggested strategies for using the resource materials were implemented. An estimate of the number of lessons out of twenty-four that on the average were classified in a category was obtained by dividing each total by four. According to questions one and two nearly one-third of the lessons stimulated high interest and much discussion in the experimental group classes. Approximately one-half of the lessons resulted in moderate interest and class discussion whereas there was meagre interest and little discussion in about one-eighth of the lessons.

The teachers, in evaluating the suitability of the lessons for the class as a whole, rated the majority of the lessons as about right and only a few were considered too difficult or too easy. In response to question four, about one-half of the lessons were rated as most appropriate to pupils of average ability whereas very few lessons were considered most suitable for the lower ability group. More than one-quarter of the lessons were rated as best suited for the upper ability group.

Questions five and six were formulated to determine the facility with which students were able to derive facts and understandings from the slides and resource booklets. The teacher responses yielded an estimation of the appropriateness of these materials for grade six social studies. Teachers' responses to the two questions indicated that in about one-half of the lessons students easily derived facts and understandings from the resource materials; in about one-quarter, students had some difficulty and in several lessons they experienced much difficulty.

The success of the lessons as gauged by question six was significant for the development of critical thinking in social studies. Teacher responses yielded some insight into how well the model of critical thinking in social studies was applied. The teacher guide contained a detailed discussion of the model in the introduction and first several lessons but thereafter greater latitude for teacher initiative was allowed. The first lessons were generally rated higher. According to the average of the teacher responses the model was applied very successfully in nearly one-quarter of the lessons, with moderate success in about one-half of the lessons, and with no success in several lessons. The responses of the four teachers indicated that generally the simplified model of critical thinking was applied with moderate success in the majority of the lessons.

Teacher responses to question eight indicated that there was some transfer of critical thinking to other school subjects. Three teachers reported a few instances of such transfer and one reported many instances.

The teacher comments that were written in response to number nine of the questionnaire tended to agree on several aspects of the lessons. All teachers regretted the shortage of resource materials and the lack of opportunity for student research. They reported that students were frustrated in attempts to locate conclusive evidence outside of the slides and resource books. One teacher reported that the children were forced into a tedious repetition of assuming that their conclusions were probably true. None of the teachers reported that they acted as resource persons in the children's search for evidence on Northern Saskatchewan.

Three teachers reported that the repeated use of the same slides to provide evidence for different problems resulted in student disinterest. Two teachers reported that the students had difficulty in using the student booklets. On the other hand, the teachers considered the slides and student booklets very useful in following the simplified model for critical thinking. One teacher noted that the students frequently discriminated between facts and assumptions in class discussions. In general the teachers expressed satisfaction with the lessons and welcomed what they viewed as a different approach to teaching social studies.

The Evaluation of Individual Lessons

The listings of the lessons in the evaluation categories of the questionnaires were reorganized to present ratings for each lesson. The teacher evaluations of each lesson were summarized in Table XXIX according to the categories of the questionnaire. A sum less than four in response to a question indicated that some teachers failed to rate that lesson. Although teacher responses were not in agreement on individual lessons, patterns, trends, and insights into the classroom situations were suggested by the averages of the ratings.

The teacher ratings suggested that student interest and discussion declined in the lessons that came after number nine. Two possible reasons were: 1. the novelty of the classroom procedures and materials may have dissipated after the first few lessons, and 2. later lessons provided fewer detailed suggestions and allowed more latitude for teacher initiative.

Evaluations of the suitability of the lessons for the class indicated a slight trend toward an increase in lesson difficulty for

TABLE XXIX

NUMBER OF TIMES EACH OPTION OF THE QUESTIONNAIRE
WAS CHECKED FOR EACH LESSON

Lesson	1	2	3	4	5	6	7
	a b c	a b c	a b c	a b c	a b c	a b c	a b c
1	2 2 -	2 1 -	- 3 1	1 1 2	3 1 -	2 - -	2 1 -
2	2 2 -	2 1 -	- 3 1	1 1 2	3 1 -	2 - -	1 2 -
3	2 2 -	3 1 -	- 2 2	- 2 1	3 - -	3 - 1	2 2 -
4	2 2 -	3 1 -	- 3 1	1 3 -	3 1 -	2 - -	1 3 -
5	2 2 -	2 2 -	1 2 1	2 2 -	2 1 1	1 1 -	2 1 -
6	3 1 -	4 - -	- 4 -	- 4 -	2 1 -	1 1 1	1 3 -
7	3 1 -	3 1 -	1 3 -	1 3 -	1 3 -	3 - -	2 - 1
8	1 2 -	1 2 -	- 2 -	2 1 -	1 2 1	2 1 1	- 2 1
9	- 3 -	1 2 -	2 2 -	2 1 -	1 1 2	2 1 1	- 3 -
10	1 1 2	- 2 1	1 3 -	1 2 -	1 1 2	2 1 -	2 2 -
11	3 1 -	3 1 -	1 3 -	2 1 -	- 2 2	2 1 1	3 1 -
12	1 2 1	1 2 1	2 2 -	1 2 -	2 - 2	1 2 1	1 1 2
13	- 1 3	- 1 3	- 2 -	3 1 -	1 - 3	3 - 1	1 2 1

TABLE XXIX (continued)

Lesson	1	2	3	4	5	6	7
	a b c	a b c	a b c	a b c	a b c	a b c	a b c
14	1 3 -	2 2 -	- 4 -	- 4 -	3 1 -	1 - 1	3 1 -
15	- 3 -	- 4 -	- 3 1	- 4 -	3 1 -	- - 1	3 1 -
16	1 2 -	1 3 -	- 3 -	1 3 -	1 3 -	1 3 -	- 3 1
17	1 1 -	1 3 -	- 3 1	1 2 -	1 3 -	1 1 -	1 3 -
18	1 2 -	1 3 -	- 3 1	2 2 -	1 - 1	2 1 -	1 3 -
19	1 - 1	1 2 1	1 3 -	3 1 -	- 2 1	2 1 1	- 3 1
20	- 1 2	- 2 2	1 2 1	3 1 -	1 - 1	1 2 1	- 2 2
21	- 3 -	- 4 -	- 3 -	1 3 -	2 1 -	1 1 -	- 3 -
22	- 4 -	1 2 -	- 3 -	2 2 -	1 1 -	1 2 1	- 2 1
23	- 2 2	- 2 2	- 2 -	2 2 -	1 1 1	1 1 1	1 1 1
24	- 3 1	1 2 1	1 2 -	2 2 -	1 - 2	1 - -	1 1 1

NOTE: Some lessons were omitted in the teacher evaluations.

some of the classrooms. Lessons thirteen to eighteen were exceptions and teachers considered these to be about right. In general the difficulty level of the lessons was considered to be about right; each lesson received this rating from two or more teachers. Most lessons were considered most suitable for the average or above average ability groups.

According to Table XXIX the students were able to derive facts and understandings from slides with relative ease in the majority of the lessons. Students tended to experience difficulty in lessons eight to thirteen where they were to develop understandings concerning health, nutrition, education, and housing. Ratings for the resource booklets indicated that in most lessons the students derived facts and understandings with relative ease and only one or two classes experienced difficulty in several lessons.

The student model for critical thinking was applied with moderate or better success in the majority of the lessons. Two teachers reported that the model was unsuccessfully applied in several lessons.

The teacher responses indicated that the lessons were moderately successful, with variations above and below this in different classes. The variations between ratings indicated that a couple of the teachers did experience difficulty with several of the lessons. There is no indication whether this was due to lack of teacher insight or the lessons themselves, since some teachers reported that the lessons were moderately or very successfully taught. No attempt was made to determine familiarity with the subject-matter of the lessons or with the teaching procedures that were advocated.

In general, the teachers reported that they were moderately successful with the lessons and the application of the simplified model of critical thinking in social studies.

III. SUMMARY

In the introductory chapter, eleven hypotheses were postulated to serve as guideposts in the investigation of the results of this experiment. In Chapter IV each hypothesis was re-stated in statistical terms and accepted or rejected according to the findings of a linear regression analysis of test data. The following results of the experiment are based on the statistical findings:

1. There was no significant difference in the development of critical thinking in social studies between the experimental group, which followed the lessons emphasizing a model for critical thinking, and a control group which used the same resource materials with regular classroom instruction.

As indicated by a significant interaction between IQ and grouping, the development of critical thinking in social studies at different ability levels (IQ) was not the same for the two groups. The development of critical thinking in social studies in the experimental group tended to be greater at the average and below average ability levels relative to that at these levels in the control group. This tendency was reversed for the high ability level. However, a significant difference between groups was not found at either the high ability level or at the average and below average ability levels.

2. There was no significant difference between the experimental group and the control group in the development of critical thinking.

3. There was no significant difference between the experimental group and the control group in social studies achievement.

4. There was no significant relationship between IQ and gains in critical thinking in social studies in the experimental group, but there was a significant relationship between IQ and gains in critical thinking in social studies in the control group.

5. There was no significant relationship in the experimental group or in the control group between IQ and gains in critical thinking.

6. There was a significant relationship in the experimental group and in the control group between IQ and gains in the knowledge of social studies facts and understandings.

7. When the effects of IQ were partialled out, there was a significant relationship between social studies achievement and the development of critical thinking in social studies in the experimental group and in the control group.

8. When the effects of IQ were partialled out, there was a significant relationship between social studies achievement and the development of critical thinking in the experimental group and in the control group.

9. There was no significant difference between boys and girls in the development of critical thinking in social studies in the experimental group or in the control group.

10. There was no significant difference between boys and girls in the development of critical thinking in the experimental group or in the control group.

11. There was no significant difference between boys and girls in social studies achievement in the experimental group or in the control group.

Teacher Evaluation of the Lessons

An evaluation questionnaire was completed by each of the experimental group teachers to provide a general overview of the success experienced in the deployment of the teaching strategies suggested in the teacher guide. The lessons were rated on student interest, class discussion, difficulty, usefulness of the resource materials, and the application of a simplified model for critical thinking in social studies. The teacher evaluations supported the summarizing conclusion that the lessons and model were employed with moderate success by the teachers.

CHAPTER V

SUMMARY, CONCLUSIONS, DISCUSSION, AND SUGGESTIONS

FOR FURTHER RESEARCH

I. SUMMARY

The teaching of critical thinking has long been recognized as a major objective in social studies, but little research has occurred to investigate strategies for teaching it in elementary school social studies. Research findings from studies on critical thinking and the inquiry method of teaching social studies in high school indicated that a simplified model for critical thinking might be successfully employed by teachers of elementary school social studies. The major purpose of this experiment was to investigate the effectiveness of having teachers apply a simplified model for critical thinking in social studies to prepared resource materials. It was also the purpose of this study to investigate the differences between boys and girls and certain relationships between the variables.

The investigator constructed twenty-four lessons, which featured the application of a simplified model for critical thinking in social studies, and presented these in guides for the experimental group teachers. The suggestions in the guides specified how the prepared resource materials were to be used to develop critical thinking in social studies and foster social studies achievement. Several of the lessons were used in a pilot study by a teacher of

social studies in two grade six classes and were found satisfactory.

No standardized test of critical thinking was available but permission was granted to use the experimental edition of the Cornell Critical Thinking Test, Level X. This test was used in a pilot study with three classes, grade six, grade seven, and grade eight, and consequently Part I was used in this experiment.

Since no standardized test of critical thinking in social studies was available for the elementary school grades, the investigator constructed such a test for the purposes of this experiment. The initial drafts of the test were revised and tried out in two pilot studies with subsequent revisions on the basis of each item analysis.

To measure pupil achievement in social studies knowledge which was derived from the prepared resource materials, an achievement test was constructed by the investigator. Prior to its use in the experiment, the test was revised on the basis of a pilot study and a subsequent item analysis.

A sample of eight grade six classes was randomly chosen from a population of the grade six classes in the Separate Schools of Regina, Saskatchewan. Four of the eight classes were randomly assigned to the experimental group and the remaining four formed the control group.

The Cornell Critical Thinking Test, the Critical Thinking in Social Studies Test, and the social studies achievement test, were administered as pre-tests by the investigator in the eight classrooms in May, 1969. For a period of seven weeks immediately following the administration of the pre-tests, the experimental group teachers used

the prepared resource materials according to the lessons, which emphasized the application of a simplified model for critical thinking in social studies. Each of the control group teachers received the resource materials and a brief outline designating the order in which the materials might be used. The Verbal and Non-Verbal Batteries of the Lorge-Thorndike Intelligence Test were administered by the writer shortly after the commencement of the experiment, but only the results of the Verbal Battery were used in the experiment. The writer administered the three achievement tests as post-tests in the eight classrooms seven weeks after their administration as pre-tests.

The test results were analyzed using regression analysis and the MULRO4 computer program to investigate the eleven hypotheses that were postulated for the experiment. The differences between the two groups, the differences between boys and girls, and certain relationships were explored. The results formed the basis for the conclusions presented in the second part of this chapter.

Evaluations of the lessons were obtained from the experimental group teachers, who completed questionnaires designed for this purpose. The questionnaires yielded ratings by the teachers on their success with the lessons, which emphasized the application of a simplified model for critical thinking to social studies resource materials.

II. CONCLUSIONS

The major conclusions of the experiment were based on the statistical analysis of test results reported in Chapter IV. The

conclusions based on the evaluation questionnaires were included with the proviso that they represent the subjective opinions of the experimental group teachers.

Major Conclusions

The following conclusions were derived from the analysis of the test results and are applicable only to populations similar to that used in this experiment:

1. The twenty-four prepared lessons, which emphasized a model for critical thinking, did not foster a greater development of critical thinking in grade six social studies than the instruction in a control group using the same resource materials without the lessons. In other words, the use by teachers of a written guide emphasizing the development of critical thinking in social studies did not produce better results than regular classroom instruction.

Likewise, the use of the prepared lessons did not result in a greater development of critical thinking than that in a control group using the same social studies resource materials.

2. There was no significant difference between the experimental group, which followed the prepared lessons, and a control group in social studies achievement. In grade six, attaining a knowledge of social studies facts and understandings was not adversely affected by the emphasis in the lessons on using a model for critical thinking. Thus, the classroom instruction emphasizing the development of critical thinking in social studies fostered the learning of social studies subject-matter as well as the regular

classroom instruction in a control group.

3. In the control group there was a significant relationship between gains in critical thinking in social studies and IQ. On the other hand, in the experimental group, which used the prepared lessons emphasizing critical thinking, there was no significant relationship between gains in critical thinking in social studies and IQ.

With the regular classroom instruction in the control group, the gains in critical thinking in social studies were related to the ability levels of the pupils as measured by IQ, that is, the larger gains were made mainly by high ability students. With the instruction experienced in the experimental group the greater gains in critical thinking in social studies were not attained mainly by high ability students, but, rather, gains were made equally well by the students of the different ability levels. A number of students of average or low ability in the experimental group made gains as great as those of high ability students.

4. In both the experimental group and the control group there was a significant relationship between IQ and gains in social studies achievement. The gains in knowledge of facts and understandings were related to pupil ability as indicated by IQ scores. The more intelligent students were better able to learn and remember facts and understandings when using social studies resource materials. This relationship existed for the regular classroom instruction in the control group and for the instruction according to the prepared lessons in the experimental group.

5. In the experimental group and in the control group there was a significant relationship between social studies achievement

and the development of critical thinking in social studies when the effects of IQ were partialled out. Likewise, there was a significant relationship between social studies achievement and the development of critical thinking when the effects of IQ were partialled out. Between social studies achievement and critical thinking in social studies there was a fundamental relationship above the relationship due to the fact that both were related to IQ.

6. There was no significant difference between boys and girls in the experimental group and the control group in the development of critical thinking in social studies, in the development of critical thinking, and in social studies achievement.

Conclusions Derived From the Evaluation Questionnaires

The teachers' responses to the evaluation questionnaires yielded a general outline of how successfully the lessons were employed in the experimental group classrooms. It must be noted that the results reflect subjective opinion and do not provide any assurance that the development of critical thinking in social studies occurred. The following conclusions are a summary of the teacher evaluations and reflect the average for the experimental group.

1. The lessons stimulated a moderate amount of student interest and discussion.

2. The lessons were best suited to the average or above average ability groups and in general were not too difficult for grade six students.

3. Grade six students were moderately successful in deriving facts and understandings from the prepared resource materials.

4. The simplified model for critical thinking in social studies was applied with moderate success to the prepared resource materials.

5. In the opinion of the teachers, there was some transfer of critical thinking to other school subjects.

III. DISCUSSION

Teaching Critical Thinking in Social Studies

As a result of the analysis of the test data it was concluded that there was no significant difference between the experimental group and the control group in the development of critical thinking in social studies. The use of the prepared lessons emphasizing a model for critical thinking did not, in the duration of seven weeks, produce greater gains in critical thinking in social studies than the regular classroom instruction in the control group. The reports of the teachers on the evaluation questionnaire suggested that critical thinking was developed in the classroom use of the lessons. Since there were no objective standards to verify the amount of critical thinking in social studies that was developed, it was necessary to rely upon test results and conclude that the development of critical thinking in social studies was no greater than that of a control group using the same resource materials without the lessons. Regardless of the teachers' ratings of the lessons, the pertinent finding is that the lessons produced results that were not significantly different from regular classroom instruction. Whether this was due to shortcomings

in the lessons or due to the teacher use of the lessons is open to conjecture. The related research and the results of the evaluation questionnaire suggested several plausible reasons for this finding.

A likely factor in the lack of significant gains by the experimental group was the short duration of the experiment. The twenty-four lessons of this experiment were sufficient for a duration of eight weeks but insufficient time necessitated the use of a shorter period. It is probable that the fostering of complex cognitive processes demands an extended time. Other similar experiments were longer (Maw, 1959; Hiram, 1956), and several extended over several months (Massialas, 1963). Using a four week period, Hunkins (1966) did not obtain significant gains in critical thinking in grade six social studies.

In the experiments using a model of critical thinking (Massialas, 1963), the investigators instructed the experimental classes and obviously had a commitment and an insight into the desired methods of instruction. In the present experiment the teachers were given written guides emphasizing the application of a simplified model for critical thinking in social studies. No effort was made to determine how well the teaching suggestions fitted their usual classroom procedures or what insights into critical thinking the teachers might have had. Past learning experiences and the classroom climate outside the social studies lessons may have affected the pupils' effective use of the model for critical thinking. While endeavoring to follow a guide the teachers may have presented the lessons in a manner more rigid than usual and limited spontaneous student interaction. The general

consensus of the teachers was that they were moderately successful with the lessons and in applying the simplified model for critical thinking, but no other evaluating device was used to verify how well strategies for critical thinking were being actualized in the classroom.

In this experiment the teachers knew that a social studies achievement test was administered and therefore were conscious of teaching the subject-matter of the topic covered by the lessons. It is conceivable that an over-concern with teaching social studies knowledge on the part of the experimental group teachers may have detracted from an emphasis on developing critical thinking skills. In the experiment by Maw (1959), which successfully employed lessons to develop several critical thinking skills, the experimental group teachers were not concerned with the knowledge of a particular subject-matter but restricted the scope of each lesson to the practice of one or more critical thinking skills.

The topic of the prepared lessons limited the classrooms to the resource materials that were provided. Experimental group teachers reported that students were frequently frustrated in their search for evidence and because of this found it difficult to draw conclusions with any certainty. This suggested the possibility that the development of critical thinking in social studies may require an ample supply of resource materials.

One of the four experimental group classes lost the set of slides in the latter part of the experiment and ceased to use the lessons for a period of nearly two weeks. When a replacement set was provided, the last several lessons were hastily completed in a

couple of days before the administration of the post-tests. A check of mean class gains on the Critical Thinking in Social Studies Test showed that this class did not have the lowest mean gain in the experimental group classes. Thus it appeared unlikely that under normal circumstances of instruction this class would have achieved gains substantial enough to affect the present results of the experiment.

The control group teachers were not limited in the teaching strategies that they employed with the prepared resource materials. It was not learned if the development of critical thinking in social studies was actively promoted. Neither was there any assessment of how well the prepared resource materials in themselves fostered the development of critical thinking in social studies. Since the control group classes were randomly selected they were considered to represent average classrooms. As such they were not surpassed by the experimental group classes in the development of critical thinking in social studies as it was measured in this experiment.

The major findings of the experiment were subject to the measuring devices used to detect the development of critical thinking in social studies. The Critical Thinking in Social Studies Test was constructed by the writer and may not have been sensitive enough to fully reflect the differences between the experimental group and the control group supposing such differences had existed. Likewise, the Cornell Critical Thinking Test, which was an experimental edition, may not have fully reflected the results in the experimental group. Both Massialas (1961) and Cox (1961) found no significant difference between the experimental group and the control group in

critical thinking ability as measured by the Sequential Test of Educational Progress, Social Studies. Nonetheless both concluded that the experimental groups had made greater progress in critical thinking as determined by an analysis of calendars and tape recordings. On the other hand, Cousins (1963) concluded that a study group made significant gains in critical thinking as measured by the Watson-Glaser Critical Thinking Appraisal, but, this was not compared to a control group. Maw (1959) constructed a Critical Thinking Test that measured a significant difference between the experimental group and the control group in attaining certain critical thinking skills.

Social Studies Achievement

The use of lessons emphasizing the employment of a model for critical thinking did not adversely affect the learning of social studies knowledge as compared to a control group using the same resource materials with regular classroom instruction. Thus, instructional procedures in social studies can include similar strategies for teaching critical thinking without a loss in the achievement of social studies knowledge.

Relationships Between Variables

In the experimental group, which used lessons emphasizing the application of a model for critical thinking in social studies, IQ was not related to gains on the Critical Thinking in Social Studies Test, whereas, in the control group the gains were related to IQ. It was inferred from this that gains in critical thinking in social studies were more closely related to natural mental growth as reflected in IQ when the development of these skills was not emphasized

in the instructional procedures. A greater emphasis on developing critical thinking in social studies would make gains possible for all students rather than continue to reserve the greater gains for those with greater mental ability as measured by IQ.

A significant relationship was found to exist between social studies achievement and critical thinking in social studies when the effects of IQ were partialled out. The results indicated that the two types of achievement had one or more factors in common besides that accounted for by the relationship of both to IQ. The findings suggested that development in critical thinking and social studies achievement tend to enhance each other, and possibly effective instruction in both could be mutually beneficial.

Differences Between Boys and Girls

The boys and girls of the experimental group showed no achievement differences in critical thinking in social studies or social studies knowledge. There was no indication that different approaches or methods would be more appropriate for either boys or girls or that either was superior in the development of the skills and knowledge being investigated.

IV. SUGGESTIONS FOR FURTHER RESEARCH

1. As suggested by related research it is likely that the duration of this experiment was too limited for the development of higher mental processes. The use by teachers of prepared lessons over an extended period and with a larger sample may produce significant results as suggested by other research (Maw, 1959).

Replication of the present study over a longer period might yield significant results in the experimental group.

2. As indicated in the questionnaire, teachers were not equally successful in applying the model for critical thinking in social studies and as a group reported moderate success. In further research, consideration could be given to an in-service program for the experimental group teachers to ensure their insight into critical thinking and their preparedness for instructing classes in the related skills. In addition, various devices could be used to investigate the interaction between teachers and students as it enhances the qualitative nature of pupil thinking.

3. Further research is required to develop effective measures of critical thinking in social studies in the elementary school grades. The only published test that was located (Wrightstone, 1939) has been out of print for several years. Tape recordings were employed to analyze the application of a model of critical thinking in high school (Massialas, 1963). The same technique could yield insights into classroom use of a model for critical thinking in the elementary school grades.

4. It is plausible that the use of resource materials has a beneficial effect on the development of critical thinking in social studies, and the lack of resource materials has a deleterious effect, but further research is required to investigate this for the elementary school grades. Further investigations might determine the amount of resource materials that are mandatory for a classroom to participate effectively in critical thinking in social studies.

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APPENDICES

APPENDIX A

TEACHER'S GUIDE

TEACHER'S GUIDE

THE INDIAN AND METIS VILLAGES OF NORTHERN SASKATCHEWAN

The purpose of these lessons is to develop the student's ability to THINK CRITICALLY while he attains understandings about Northern Saskatchewan. It is imperative that you become thoroughly familiar with the classroom method and procedures set out in this guide and that they be consistently applied for all lessons.

Generally, a problem-solving approach is to be used. A method of inquiry whereby children investigate, make inferences, and draw conclusions is necessary to develop critical thinking skills and social studies understandings while using the lessons on Northern Saskatchewan.

The following general principles are listed to assist you in orientating yourself toward the better development of THINKING. These are based on ideas presented in Education for Effective Thinking by Burton, Kimball & Wing, 1960.

1. Direct attention to contrasting reports or interpretations of what has been seen, heard, or read. Bring out the effects of different frames of reference and experiential backgrounds that people have.
2. Encourage free discussion but guide it into constructive channels in a search for causes and consequences through reasoning. ("If this is so, then we can expect or should look for. . .").
3. Keep the problem before the class as the constant point of reference. Indicate the bearing of the discussion on the problem.
4. Ask the students for facts, sources, and reasons to back up the assertions or conclusions that they contribute. Classify and evaluate the different sources of information. Distinguish fact from opinion.

5. Develop the understanding that conclusions are tentative and based on available information and that in some instances conclusions must be withheld until further information is available.
6. Allow all views to be heard and critically analyze each one.
7. Lead students to recognize why they hold certain views.
8. Probe for unexpressed reasons that are taken for granted by the student himself and in what he reads or hears.
9. Continually clarify ambiguous terms and request restatement to keep the meaning clear.
10. Display a list of rules about clear thinking that were learned in previous lessons.

In order for critical thinking skills to receive full utilization in the lesson plans it is necessary to follow definite procedures in reacting to the prepared materials. The following description of the six phases of the Inquiry Method are based on those given in Inquiry in Social Studies by Massialas & Cox, 1966.

ORIENTATION: The students become sensitive to an existing problem situation. The problem may be expressed by the teacher as a question. This phase focuses on a question which calls for an explanation or a solution.

HYPOTHESIS: This is a primary statement of explanation or solution related to the question that has been raised. It guides the students in looking for relevant evidence.

DEFINITION: This is not a separate phase but rather a part of the other phases. There must be agreement on the meaning of terms to have fruitful discussion. It is characterized by the question, "What do you mean by . . . ?"

EXPLORATION: The hypothesis is more carefully considered in terms of its implications and assumptions and may be reconstructed. This leads to a search for evidence to support the hypothesis.

EVIDENCING: Evidence is obtained in support of the hypothesis. The hypothesis and its implications indicate the type of evidence that is needed.

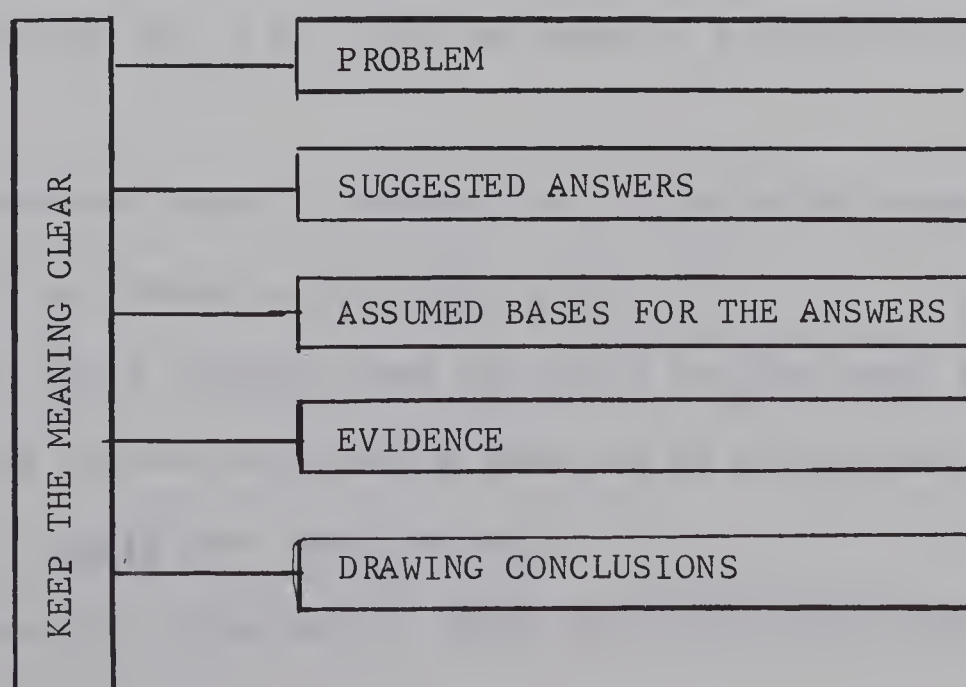
GENERALIZATION: This represents the most tenable solution to the problem based on all available evidence. The generalization is recognized as tentative. Limitations to its application may be set.

The following simplified version is to be used with the children and the diagram should be put on the chalkboard to guide classroom procedures in using the prepared materials.

GUIDE FOR THINKING IN SOCIAL STUDIES.

1. State exactly what we are trying to find out or solve.
2. Suggest possible answers from what we already know.
3. Decide what would support our answers.
4. Find evidence that would support or weaken our answers.
5. Consider the evidence and change the answers into sound conclusions.

The five phases of inquiry with emphasis on critical thinking are diagrammed as follows:



The following hypothetical situation illustrates how children would use the above five steps to solve a problem:

"You are alone in the house and are reading in your bedroom on Sunday afternoon when you hear a mysterious noise in the basement. You are frightened and want to know what made the noise."

The PROBLEM in this example (what we are trying to find out or solve) would be stated as "What made the noise?"

When a class is faced with this problem, it might ask, "What do you mean by noise?" (definition), and this would be clarified by the teacher. When it is understood that noise in this instance meant a bang, the children would suggest possible answers. The answers might include: "a cat", "a burglar", "a loose window", "a bird", and others.

The children would decide what to look for and what they would expect to find for an answer to be true. It could be as follows:

- a cat--a frightened cat in the basement and an object that had fallen or been overturned.
- a burglar--an open or broken basement window providing exits are locked; other sounds indicate a man is present.
- a bird--an open window and a bird fluttering about.

"The child went downstairs to collect evidence and found a cat cowering on the steps and a box that had been on a shelf now lying on the floor."

No evidence was found to support any of the other suggested answers and none was found to contradict this one.

The class would conclude that the noise had been made by the cat. Had he found only the cat and nothing else out of order, they could have concluded that it might have been the cat.

The lessons are organized to teach understandings about the Indian

and Metis people of Northern Saskatchewan. The directions for each lesson indicate how Critical Thinking skills can be used as the basis for discussion, locating evidence, and drawing conclusions. The more each child is involved, the greater will he profit from the exercises to develop his thinking. Be certain to give opportunity for the slower thinkers to participate in the discussions. As the class progresses through the lessons, ask them to state rules for better thinking that they have learned. Build a list as these points appear relevant in class discussions rather than dictating a complete list. Keep these rules displayed on a chalkboard under a title such as "Hints for Clear Thinking". This list might include statements such as:

Be sure you have enough evidence before making a conclusion.

State clearly what you mean.

Do not go beyond the facts.

Keep the problem clearly in mind.

Choose evidence related to the problem.

Consider how reliable the evidence is.

Recognize what facts have been given to support the argument.

Recognize what is assumed and not given as facts.

State your conclusion as probably true or true for certain instances if the evidence requires this.

Consider what could be said from the conclusions.

Since productive class discussions are the key to success in the lessons every effort must be made to facilitate organized thinking. Whenever it is feasible to use the chalkboard during discussions, diagram the relationship of the ideas that are presented. These may take the form of a "tree", a two-dimensional grid, a three-dimensional solid with many cells, or various other forms.

LESSON 1

PURPOSE: This lesson is to teach understandings concerning the physical geography of Northern Saskatchewan.

MATERIALS: Slide Number: 10 Landscape of lakes.
39 Aerial view of sandspots.

PROCEDURE:

Since this is the first lesson, spend some time introducing the new topic and procedures that will be followed. Emphasize that the class will learn to THINK CLEARLY and CAREFULLY in learning about the Indians and Metis of Northern Saskatchewan. Draw attention to the Guide for Thinking that has been displayed on the chalkboard or bulletin board. State that these steps will be used and discuss each briefly. Stress that the children must find evidence to back up what answers they give, and must check information carefully to see if it is reliable. Use the example given on Page 4 of this guide to illustrate the phases of critical thinking in solving a problem.

View slides number 10 and 39(landscape from aircraft). Welcome class discussion and direct it to the problem of "What type of land and climate is there in Northern Saskatchewan?" Write the problem (as a question) on the chalkboard and discuss possible answers. Help the class to realize that they must find more evidence. Discussion may also include where and how the pictures were taken. Encourage the class to offer explanatory answers in the light of what is shown on the slides. Their answers may include the following as well as others:

1. It is a land of much water.
2. The land is covered with forest, much of which is evergreens.
3. There are some hills.
4. It is difficult to travel; there are no roads to be seen.
5. With so much water there are many hydro-electric power plants.

Interject other explanatory answers that obviously require much more information (if they are not offered). Preface the answers that you provide with "One boy said . . . when he was shown this slide".

Some of these answers might be:

6. Fur bearing animals live in the forests.
7. There are large flat areas without water.
8. The landscape appears this way all year.
9. There are few towns.

N. B. It must be stressed that the class, in this or any other lesson, should NOT be limited to the answers provided in the guide nor must they use the exact words. It must similarly be stressed that the children do the thinking and discussing and that the teacher is there to stimulate and guide their thinking.

Do not let the class discard unlikely answers too quickly unless they can produce evidence from the slide or other sources that this should be done. Stop and consider the reliability of these other sources.

Discuss the suggested answers and make them clear and general enough to explain large amounts of information. Have the students decide on what evidence they would look for and what they would expect to find if the suggested answer is true. For example, for "It is a land of much water", evidence of many lakes and streams as shown on a map would be required.

The children should learn to question the source of the information, e.g. "Where were the slides taken?"

Use the accompanying list to find out the available data on each slide. Information obtained from slides may be supported from evidence provided in books and atlases.

ASSIGNMENT: Ask the children to obtain evidence from atlases, books, and other sources or contradict the list of suggested answers. Tell them to have it ready to support the arguments they might use next day.

LESSON 2

PURPOSE: This lesson is to continue the development of understandings about the physical geography of Northern Saskatchewan.

MATERIALS: Slide Number: 40 Rocky hill in forest
41 Cliff by river
13 Lake in winter
14 Lake in summer
20 Lake in spring

Two transparencies which show the villages and the vegetation
Large map of Northern Saskatchewan
Student booklets item # 1

PROCEDURE:

Review the list of suggested answers. Write them on the chalkboard. Project slides 40, 41, 13, 14, and 20, and discuss how these support the suggested answers. List other suggested answers that may arise from the slides and possibly revise some in the previous list. Discuss only the information that is related to the problem and the suggested answers. These slides will be used again to provide evidence for other problems.

Project the transparencies. View the transparency on vegetation and Precambrian Shield and discuss what this depicts about Northern Saskatchewan. The children may need assistance in understanding what one would find in each region. Refer to item #1 of the student booklet for a description of the Precambrian Shield. Read item #1 out loud to assist the poor readers. Consider the towns found in Northern Saskatchewan, and note their location and number.

Refer to the large map to contrast the number of lakes and streams

found in Northern and Southern Saskatchewan.

Spend time discussing the evidence from other sources that the children have found to support their answers. Emphasize that answers must be supported or it must be admitted that "we cannot tell".

Use all the available evidence to discard, change, or accept the suggested answers that have accumulated and are listed on the chalkboard. Through class discussion and with teacher guidance, arrive at a list of generalizations about the physical geography of Northern Saskatchewan. Some generalizations would include limitations in that they would apply to certain areas or at certain times. Stress that many generalizations are tentative and would change if more evidence were found.

REMINDER: During each lesson rephrase and add to the list of "Rules for Clear Thinking".

ASSIGNMENT: Ask the students to write statements on how they would expect people to make a living in the North and to list supporting facts from their knowledge of the physical geography.

LESSON 3

PURPOSE: This lesson is to develop some understanding of the animal life that exists in Northern Saskatchewan.

MATERIALS: Slide Number: 3 Fish in tubs
6 New Coop store (bearskins)
7 Dead wolves
8 Bear Cub
9 Scene after the shooting of seven caribou
22 Moose hide being scraped
Picture of Ptarmigan and of beaver.

PROCEDURE:

Project slides number 3, 6, 7, 8, 9, and 22 and lead the students

to wonder about the animal life that one would find. Through discussion, formulate this into a problem for investigation.

As the slides are shown discuss possible answers to the problem. Note how meagre the available information is. The class might give an answer such as: "Bear, wolves, caribou, and moose are animals found in Northern Saskatchewan." Some children or the teacher might propose that there are fox, mink, beaver, muskrat, ermine, otter, etc. also in Northern Saskatchewan.

Discuss how further evidence could be obtained and what one would expect to find if the answers are true. Proceed to draw generalizations from the available evidence in the slides while projecting them a second time. Use this opportunity of having insufficient data to stress that only limited generalizations can be drawn and that these must be tentative.

ASSIGNMENT: Ask the children to find further evidence to support the answers that were suggested. Refer them to the Department of Natural Resources Resource Book and other books in the library.

LESSON 4

PURPOSE:- to develop understandings about the Indian and Metis people who live in Northern Saskatchewan.

MATERIALS: Slide Number: 1 Metis Wedding
2 Chipewyan and Cree Indians
3 Metis with fish
4 75 year old woman
5 Indian women by tepee for smoking fish
22 Indian women scraping moosehide
23 75 year old Chipewyan Indian
24 Indian boys in tent
34 Children inside a house
35 Metis digging a well

PROCEDURE:

Project the slides and while doing so lead the children to inquire

PROCEDURE: View the map (Item #5) together with the children. Discuss the Indian way of life and focus toward this as the problem. State the problem on the chalkboard. Have the students formulate possible answers to the problem. Possible answers would include statements on the nomadic way of life, the dependence on nature, acquiescence in low living standards, lack of ambition, etc. Note changes that are occurring. Reveal the underlying assumptions for each statement.

Read with the class #3 and #6, giving extra assistance to the understanding of #7. Form generalizations, some tentative, from the available information. Stress the need to support one's answer. Continue the list of Hints for Clear Thinking on the chalkboard.

ASSIGNMENT: Ask the children to find evidence to support their suggested answers and also for the generalizations that are tentative.

LESSON 6

PURPOSE: - to develop understandings of the Indian heritage through a consideration of their crafts.

MATERIALS: Slide Number: 22 Scraping moosehide
 43 Moosehide scrapers
 21 Putting beadwork on mukluks
 23 Making birch bark baskets
 25 Coop handicraft center
 26 Cutting patterns in leather

PROCEDURE: Discuss Indian crafts and develop a statement of the problem--
 What heritage as shown in crafts do the native people have?

Project the slides without discussion other than to identify them. Then discuss possible answers to the problem and what the children would look for and find to support them. The children might contribute answers such as:

The native people do beadwork on moccasins and jackets.

The craft work is done to sell to tourists.

They are forgetting their crafts.

One design (flowers) predominates in their handiwork.

Note the words all, some, and few in speaking of the prevalence of the crafts and in finding evidence to support this. Discuss changes that are occurring.

Project the slides slowly a second time with repetitions if necessary to discover evidence and at the same time formulate generalizations. Remember that this should be done through student discussion and that the teacher should not tell the children the answers.

REMINDER: Keep a list of Rules for Clear Thinking on the chalkboard and refer to them often. Rephrase and add to them as you go along.

ASSIGNMENT: Ask the children to find other evidence concerning Indian crafts.

LESSON 7

PURPOSE: -to develop understandings concerning Indian and Metis housing.

MATERIALS: Slide Number: 23 Old Chipewyan woman making baskets
 34 Interior of native home
 24 Tent home
 37 Log cabin at Buffalo Narrows
 38 Black Lake settlement
 28 New Indian houses at Pelican Narrows
 45 Houses at Black Lake

PROCEDURE: Discuss the types of homes that the native people live in and formulate a problem for research. State it on the chalkboard.

Have the class give possible answers and suggest the evidence they would have to find to support them. Possible answers are:

1. The native people live in dilapidated log houses without adequate facilities.

2. Some live in newer frame bungalows.

3. Some live in tents.

Project the slides and discuss evidence as it argues for or against

the suggested answers. Draw conclusions but point out the need for further evidence.

ASSIGNMENT: Have each student write an argument listing evidence to support one of the suggested answers.

LESSON 8

PURPOSE: - to develop understandings about Indian and Metis housing.

MATERIALS: Student Booklet Item : 8 A Poor Family
9 A Typical House
10 Housing

PROCEDURE: Use the conclusions from last lesson as the suggested answers for this one. Allow the students to present and criticize the arguments they have prepared from last lesson.

Read aloud Numbers 8, 9, and 10 in the student booklets, and discuss the evidence as it relates to the answers. Note the dates of the sources and how this affects conclusions for 1969. The slides are more recent.

Refer them to the Rules for Clear Thinking that have been written on the chalkboard and add other rules as the lesson progresses. Discuss suggested ways in which native housing can be improved. Assist them to probe their arguments for valid evidence and implicit assumptions that have not been supported, e.g. "What assumptions underlie the statement that each family should build a new house?"

ASSIGNMENT: Each student should write his suggestion for improving housing and support it with evidence. Caution him to beware of making assumptions without stating supporting facts.

LESSON 9

PURPOSE: - to develop understandings about the organization of houses in villages and some services such as water and sewage disposal.

MATERIALS: Slide Number: 38 Black Lake Settlement
28 New Indian houses at Pelican Narrows
45 Houses at Black Lake
27 Pelican Narrows townsite
35 Metis digging a well, Green Lake

Student Booklet Item : 15 Types of Services in Villages.

PROCEDURE: Recalling previously viewed slides, speculate on how houses are situated and the facilities they have. Formulate and state the problem on the chalkboard.

Organize possible answers on the chalkboard and discuss what evidence would support them. Some answers might be similar to:

1. There is no tap water and no sewage disposal. Outdoor facilities are used.
2. Houses are irregularly and haphazardly set out. There is no planning.
3. Water is obtained from wells or lakes.
4. Villages are located on lakeshores and are scattered across Northern Saskatchewan.

Project the slides and draw conclusions concerning the supported answers. Note that now the slides are being scrutinized for different facts than those required in Lesson 7. Use Student Booklet Item 15 and the map to yield facts on the population and location of villages. Continue the discussion on suggestions for improving housing while encouraging them to detect unsupported assumptions and to consider how good the stated facts are. They must realize what is required for their suggestions to be practical.

ASSIGNMENT: Encourage the students to locate more evidence related to the suggested answers.

LESSON 10

PURPOSE: - to develop understandings regarding native health and nutrition and the health services that the government provides.

MATERIALS: Slide Number: 34 Interior of a native home.
 24 Public health nurse visits tent
 32 Hospital at Pelican Narrows
 22 Scraping a moose hide
 9 Metis and seven caribou carcasses
 5 Smoking fish
 37 Log cabin and garden
 19 Bags of wild rice at Deschambault

Student Booklet Items 12 and 15

PROCEDURE: Direct discussion to the health and nutrition of native people and focus on this as the problem to be considered. List suggested answers describing the health and diets. Some ideas that they might formulate are:

1. There are hospitals and nurses in the villages.
2. Some children have skin sores.
3. Health standards are poor.
4. Their diet consists of moose, caribou, and fish.
5. Some places grow vegetables.

Others may be added and developed into conclusions as the materials are used.

Project the slides and direct observations to locating evidence pertinent to the problem. Refer to rules for clear thinking that restrict generalizing beyond the facts and to the limitations of conclusions that can be drawn. Note the terrain that is found in most of Northern Saskatchewan when considering gardens. Direct the class to the booklet items. Help with the reading; the passages are difficult. Add suggested answers and draw conclusions regarding types of illnesses and causes of poor health. Use Item 15 to locate the outpost hospitals in the north.

ASSIGNMENT: Have the children find out about the illnesses mentioned in the materials.

LESSON 11

PURPOSE: - to develop understandings concerning education for children in Northern Saskatchewan.

MATERIALS: Slide Number: 48 School at Stony Rapids
 42 4-H Woodwork--Pine House Lake
 49 Classrooms at Stony Rapids

Student Booklet Item: 8 A Poor Family
 6 Chipewyan Trappers at Wollaston
 15 Types of Services in Villages

PROCEDURE: Open discussion by having the children tell what they know of education in the North and then formulate the problem.

List possible answers although their knowledge on the topic is probably meagre. Suggested answers might include these ideas:

1. There are many small log schools with few facilities.
2. There are few schools and few children attend regularly.
3. Children do poorly in school.
4. Some children never attend school.

Discuss what is assumed to be true for the suggested answers to be true and what evidence is necessary to support the answers.

View the slides and consider those aspects only of the student booklet items that are pertinent as evidence. Draw attention to Item 15 which lists some villages without schools and what this implies. Draw conclusions while assisting the children to realize how tentative and limited these are because of limited evidence which did not describe more than a few schools. Discuss the application of these generalizations, e.g. How will this affect the kind of education the children receive?

REMINDER: Keep a list of Rules for Clear Thinking on the chalkboard and refer to it often as well as rephrase and add to the list.

ASSIGNMENT: Ask the children to try to find out more about Northern education to support the generalizations and implications of these generalizations.

LESSON 12

PURPOSE: - to develop understandings about the services that are provided in the villages.

MATERIALS: Slide Number: 1 Metis Wedding at Wollaston
 27 Pelican Narrows townsite
 51 H. B. C. Store at Stony Rapids
 6 Coop Store at Deschambault
 52 D. N. R. Office at Stony Rapids
 53 R. C. M. P. Detachment at Stony Rapids

Student Booklet Item: 2 Missionaries
 15 Types of Services in Villages

Large map of Northern Saskatchewan
 List of store items and prices at Stony Rapids

PROCEDURE: Discuss what main service buildings (church, store, D. N. R., Post-Office, R. C. M. P., etc.) one would expect to find in a typical village and develop student interest in finding out. Record suggested answers on the chalkboard and discuss what evidence would be needed to support them. Possible answers would include ideas on the main buildings and quantity of services in villages.

Answers might include:

1. The main buildings in a village are the mission and the store.
2. Only a few villages have hospitals.
3. Only certain villages have D. N. R. offices and R. C. M. P.
4. Stores are found in nearly all villages.
5. Many villages have few services.

Project the slides and draw conclusions concerning the kind of service buildings shown. Note the difficulty in generalizing from a few slides. Refer to Student Booklet Items 2 and 15. Read the pertinent parts aloud. Use the map in conjunction with the chart in Item 15 to determine which services are more usually located in villages.

ASSIGNMENT: Find evidence concerning the place of the Hudson Bay Company in Northern Saskatchewan.

LESSON 13

PURPOSE: -to develop understandings about the rapid population growth, its causes, and the implications for required services and employment.

MATERIALS: Student Booklet Item: 13 Population Increase
 14 Reason for Population Increase
 15 Types of Services in Villages

PROCEDURE: Discuss the density of population in the north as compared to other parts of Canada and lead to the problem: "Is the north densely populated, is there change, and what effects does this have?" The problem as developed by the students should be stated in more than one question.

Assist the children to derive data from the graph and the other two items. In this instance the process of suggesting possible answers, stating underlying assumptions, finding evidence, and drawing conclusions can be combined as the information in the student booklet is discussed. Channel the discussion to effective use of the Rules of Clear Thinking. Insist that students support their conclusions with sound arguments. The conclusions derived from the evidence should contain ideas on the sparse population, need for services, and scarcity of employment with rapid population increase. Discuss other implications of these generalizations.

ASSIGNMENT: Have the students compare areas and populations of northern and southern Saskatchewan.

LESSON 14

PURPOSE: - to develop understandings about the transportation of passengers and freight over long distances in Northern Saskatchewan.

MATERIALS: Slide Number: 10 Landscape from plane
 14 Cessna and three dog sleds
 16 Beaver aircraft and dogteam
 17 Helicopter
 36 Aircraft--unloading fish
 18 Canso aircraft unloading
 15 Large boat at Deschambault
 44 Barges--Lake Athabasca
 13 Bombardier in winter

Saskatchewan Road Map
Large map of Northern Saskatchewan

PROCEDURE: Discuss the vastness and lack of cities in Northern Saskatchewan. Compare modes of transportation in Southern Saskatchewan with what the children would anticipate to be used in the North. Clarify the problem and list suggested answers. Use the highway map to discern the availability of roads and railroads to the north.

Project the slides and look for evidence to support conclusions about long distance transportation in the North. Interject the question of whether caterpillar trains are used and lead discussion to a decision to withhold judgment until more information is obtained.

Distinguish types of freight and appropriate transport and draw conclusions concerning the advantages of different methods of transportation. Note the restrictions on different modes of transportation at different times of the year, e.g. spring break-up.

ASSIGNMENT: Find evidence regarding the use of caterpillar trains in the north.

LESSON 15

PURPOSE: -to develop understandings concerning transportation of passengers and freight over short distances in Northern Saskatchewan.

MATERIALS: Slide Number: 14 Cessna and dog teams
16 Beaver aircraft and dogteam
15 Large boat at Deschambault
13 Bombardier in winter
11 Trapper with motor toboggan
12 Caterpillar pulling sleighs
20 Canoe on Lac La Ronge
33 Fishermen and guide
50 Mining line camp

Large map of Northern Saskatchewan

PROCEDURE: Focus discussion on local transportation in the North, state it as a problem, and list possible answers. One suggested answer should be on the changes that are taking place. Have the children probe for the underlying assumptions and what evidence would support each one. The question directed to the originator of a suggested answer could be stated as: "You are assuming that . . . What would support your assumption?" Clarify the meaning of "assumption". Use this approach in future lessons.

Project the slides noting the places on the map where they were taken. View each slide pointing the discussion toward the search for evidence related to the problem. Draw conclusions but remember the Rules for Clear Thinking.

ASSIGNMENT: Have each student choose a mode of transport that he would use to travel from Deschambault to Pelican Narrows in winter. He must construct a written argument with supporting facts and consider cost, speed, and ease of travel.

LESSON 16

PURPOSE: -to develop understandings about Indian and Metis trapping in Northern Saskatchewan.

MATERIALS: Slide Number: 46 Pelts at H. B. C. Store--Black Lake
47 Pelts at H. B. C. Store--Black Lake
20 Indians with furs in a canoe

Student Booklet Item 11 Fur Harvest and Prices

PROCEDURE: Focus class discussion on the question of what animals are trapped, how they are trapped and how furs are prepared. Assist the class to organize their suggestions into answers to the problem in the light of what they have learned about animal life in a previous lesson. Project Slides 46, 47, and 20 and refer to Item 11 of the student booklet. Assist weaker students in understanding the chart. Lead the children to detect facts and assumptions in what they say. Discuss what further evidence is

required. Draw conclusions commensurate with the available data.

REMINDER: Keep a list of Rules for Clear Thinking on the chalkboard and refer to them often as well as rephrase and add to them.

ASSIGNMENT: Request the children to search for more evidence appropriate to the problem.

LESSON 17

PURPOSE: - to develop understandings about Indian and Metis trapping in Northern Saskatchewan.

MATERIALS: Slide Number: 14 Three dog teams--Wollaston
20 Indians with furs in a canoe
11 Trapper camping for the night

Student Booklet Item: 16 Activities of Five Trappers
17 Cost of Equipment for a Trapper

PROCEDURE: Review last day's generalizations on trapping and make adjustments to conclusions appropriate to the new evidence that the class has accumulated. Discuss the reliability of their evidence and how it provides facts for yesterday's assumptions.

Guide discussion to the question of how Indians and Metis organize their trapping activities and the times of peak employment. Write the new problem on the chalkboard and elicit possible answers with statements of what would provide appropriate evidence for each. Project the slides while organizing possible answers. Possible answers would suggest conveyance, distance, time of year, duration, and supplies needed.

Read Student Booklet Item 17 and use the information to draw generalizations on what supplies are needed. Read Item 16 out loud to assist poor readers and discuss the facts while using them to draw sound conclusions about trapping.

ASSIGNMENT: Ask each student to write a paragraph on how he would go trapping if he lived in the North and to list arguments to support his choices.

LESSON 18

PURPOSE: - to develop understandings about Indian and Metis trapping in Northern Saskatchewan.

MATERIALS: Student Booklet Item Number: 11 Fur Harvest and Prices
16 Activities of Five Trappers
17 Cost of Equipment for a Trapper
18 Trapping Incomes
6 Chipewyan Trappers at Wollaston

Transparency of Fur Conservation Blocks in Northern Saskatchewan

PROCEDURE: Referring to last day's discussion, develop a new problem:

What benefit does the native derive from trapping? Elicit answers that should vary from the aesthetic pleasure of being out-of-doors to the practical question of dollars earned. Along with the question of monetary returns pose the question of why returns as noted in Item 16 were low and formulate possible answers.

Refer to Items 11, 16, 17, and 18 and draw conclusions on what benefits are realized by the trapper. In this, as in other lessons, assist the students to derive facts from the student booklet if they are experiencing difficulty. Project the transparency and encourage the students to draw conclusions on why certain areas have low returns. Areas with low returns are near villages. Read Student Booklet Item 6 to explain the Northeast corner returns.

Apply the conclusions by having the class discuss what this means to the native way of living.

ASSIGNMENT: Have each student present a written argument of how he would make a better living as a trapper. After this, each should list what he assumed in his argument and what he provided as facts.

LESSON 19

PURPOSE: - to develop understandings about Indians and Metis engaged in commercial fishing in Northern Saskatchewan.

MATERIALS: Slide Number: 3 Metis and fish by a cabin
36 Unloading fish at Coop Fish Plant--Pelican Narrows
30 Coop Fish Plant--Pelican Narrows
15 Large boat for freight and fish

Student Booklet Item: 20 Fish Prices
21 Methods of Fishing
15 Types of Services in Villages

Pictures of fish
Large map of Northern Saskatchewan

PROCEDURE: Use the pictures of fish to stimulate discussion and formulate a problem: How and where is commercial fishing carried out in Northern Saskatchewan? Encourage the children to discuss possible answers and to state what they assume in each and what evidence they would require. ("If such is true, then I would expect to find. . .")

Project the slides and note what pertinent facts can be observed. Draw attention to the limited inferences that can be drawn and how each conclusion is tentative. Refer to Student Booklet Items 20, 21, and 15 (number of filleting plants) and draw conclusions while revising previously suggested answers on types of fish, mode of fishing, filleting plants, and transportation. Use the map to discuss places of commercial fishing. Remember to insist that students support answers with sound arguments and evidence. Bring to light assumptions and what is required to support them.

ASSIGNMENT: Request each student to write an argument with supporting facts in support of building more filleting plants.

LESSON 20

PURPOSE: - to develop understandings about Indians and Metis in commercial fishing in Northern Saskatchewan.

MATERIALS: Student Booklet Item: 21 Methods of Fishing
 19 Fishermen's Expenses
 20 Fish Prices
 22 Fishermen's Earnings

PROCEDURE: Through class discussion, clarify the problem--How successful are native people in commercial fishing and what income does it provide them? Discuss the advantages and disadvantages while listing possible answers to the problem. Consider sources of evidence and what facts are needed.

Refer to the Student Booklet items and revise the suggested answers into generalizations relevant to the problem. Assist weaker students in reading the charts and paragraphs.

Discuss the implications of the conclusions for the living standards of native people and suggest ways to improve incomes. Request students to scrutinize statements for sound supporting arguments and reliable evidence. Encourage a cautious attitude toward proposing solutions that will increase incomes.

ASSIGNMENT: Ask each student to develop one suggestion for improving the lot of the fishermen and to provide sound supporting arguments.

LESSON 21

PURPOSE: - to develop understandings about the benefits the tourist trade has brought to the Indians and Metis of Northern Saskatchewan.

MATERIALS: Slide Number: 29 Tepee advertisement--Coop Indian Camp
 33 Guide and tourists in boat

Student Booklet Item: 4 Tourist Trade
 Large map of Northern Saskatchewan

PROCEDURE: Use the large map and project the slides to focus discussion on the problem of how the tourist trade helps the north and more particularly how it helps the native people. Formulate the latter as the problem. Elicit possible answers on the employment possibilities and guiding as a way of making a living. Write these on the chalkboard and obtain suggestions on incomes derived by guides.

Read Item 4 out loud. Then encourage students to infer answers to the problem and revise original answers into conclusions. Discuss implications of the conclusions about income, time of year, and regularity of employment for native living standards.

ASSIGNMENT: Ask the class to obtain tourist advertisements on Northern Saskatchewan and then to evaluate them in the light of how what is advertised would assist native people.

LESSON 22

PURPOSE: -to develop understandings concerning the seasonal nature and kinds of Indian and Metis occupations.

MATERIALS: Student Booklet Item: 24 Annual Work Cycle
 25 Occupations--Pelican Narrows
 26 Main Occupations--Pelican Narrows
 27 Occupations--Cumberland House

Large map of Northern Saskatchewan

PROCEDURE: Formulate the problem and write it on the chalkboard. Use chalkboard diagrams and charts to illustrate the ideas of the class on Indian and Metis occupations. Stress the importance of stating evidence that has already been disclosed in previous lessons and is pertinent to the problem. Reveal hidden assumptions in suggested answers.

Use the student booklet items and while doing so guide the students in making correct inferences from the data. Re-structure the suggested answers into generalizations supported by the available data. Use the map to illustrate the vastness of Northern Saskatchewan and the danger of

using the data from a few villages to generalize for the entire area. Do not tell this to them but lead them to derive these understandings from the map and data.

ASSIGNMENT: Ask the students to consider other possible occupations and to search for more evidence.

LESSON 23

PURPOSE: -to develop understandings concerning recent employment opportunities for native men such as mink ranching, mining, prospecting, and forestry.

MATERIALS: Slide Number: 50 Mining line camp near Stony Rapids
Student Booklet Item: 23 Mink Ranching
Large map of Northern Saskatchewan

PROCEDURE: State the problem of finding out what other employment opportunities are available. Using the map and referring to the geography of the region elicit class discussion on possible answers and their feasibility. Interject the place of welfare and family allowance in the economy.

Project the slide and read Student Booklet Item 23 while drawing conclusions. With further discussion lead the class to realize the limited scope of most of the conclusions.

ASSIGNMENT: Ask the class to search for more evidence about other employment possibilities in the north and to obtain information on the Pulp Mill at Prince Albert.

LESSON 24

PURPOSE: -to develop understandings about the improvement of living standards in Northern Saskatchewan.

MATERIALS: Large map of Northern Saskatchewan

PROCEDURE: Open discussion on the problem of improving living standards in Northern Saskatchewan. Use the map to refer to the physical geography and to different regions.

Encourage the class to think clearly before stating realistic answers to the problem and to include supporting facts in a sound argument. Focus attention on revealing hidden assumptions in answers and on what further evidence is needed. Utilize any sources of information already covered as evidence in support of or against suggested answers.

ASSIGNMENT: Request each student to present a sound written argument in support of a proposed remedy for low living standards in the north.

APPENDIX B

LIST OF SLIDES ON NORTHERN SASKATCHEWAN

SLIDES ON NORTHERN SASKATCHEWAN

1. Metis Wedding at Wollaston.
2. Chipewyan and Cree Indians.
3. Metis with fish by cabin--Hatchet Lake.
4. 75-year-old woman smoking pipe.
5. Smoking fish in tent by water.
6. New Co-op Store (bearskins) at Deschambault.
7. Dead wolves--Deschambault.
8. Bear cub--Deschambault.
9. Metis loading dogsled after shooting seven caribou near Wollaston.
10. Landscape of lakes and a second plane off port wing.
11. Trapper camping for the night.
12. Small caterpillar pulling a load on ice.
13. Bombardier travelling on lake in winter near Wollaston.
14. Three dog sleds leaving Cessna on lake near Wollaston.
15. Large boat for freight and fish--Deschambault.
16. Dog team lying down, sled half-packed at Beaver aircraft.
17. Helicopter--Deschambault.
18. Canso aircraft at Wollaston. It hauls out fish and brings in store freight.
19. Bags of wild rice--Deschambault.
20. Indians in a canoe bring in furs to Lac La Ronge.
21. Woman of La Ronge does beadwork for mukluk uppers.
22. Indian women scraping moosehide near Lac La Ronge.
23. Angela Soloman Patunak, 75-year-old Chipewyan Indian, making birch bark baskets; she also makes moccasins decorated with porcupine quills, almost a lost art amongst the Indians.
24. Public Health Nurse at Buffalo Narrows bandages injured foot of young Indian boy in tent during home visit.
25. Interior of the Co-op Handicraft Centre, Lac La Ronge, Sask.
26. Cutting patterns in leather, La Ronge Co-op Handicraft Centre.
27. Pelican Narrows townsite.
28. New Indian houses at Pelican Narrows.
29. An authentic northern Teepee advertises the Co-op Indian Camp, Mista-Nosayew, Pelican Narrows.
30. Co-op Fish Plant, dock side, Pelican Narrows.
31. An Indian lady making a purchase at the Co-op Store, Deschambault.
32. Hospital, Pelican Narrows.
33. Fishermen and Guide from the Co-op Indian Tourist Camp, leaving for a day of fishing, Pelican Narrows.
34. Interior of native home in La Loche.
35. Metis digging well, Green Lake.
36. Unloading fish at the Co-op Fish Plant, Pelican Narrows.
37. A log cabin home at Buffalo Narrows. Approximate size of the cabin is 12 by 16 feet.
38. Log cabins--Black Lake settlement.
39. Aerial view of sandspots.
40. Rocky hill in forest at Stony Rapids.

Slides on Northern Saskatchewan (continued)

41. Cliff on river near Stony Rapids.
42. 4-H Woodwork at Pine House Lake.
43. Moosehide scrapers from leg-bone and hairscrapers from spruce root and axe-blade.
44. Barges on Lake Athabasca--Stony Rapids'.
45. Black Lake--old and new homes in winter.
46. Pelts at H. B. C. Store--Black Lake.
47. Pelts at H. B. C. Store--Black Lake.
48. School at Stony Rapids.
49. Classroom at Stony Rapids.
50. Mining line camp near Stony Rapids.
51. Hudson's Bay Co. Store--Stony Rapids.
52. D. N. R. Headquarters--Stony Rapids.
53. R. C. M. P. Detachment--Stony Rapids.

APPENDIX C

STUDENT BOOKLET

STUDENT BOOKLET

INDIANS AND METIS OF NORTHERN SASKATCHEWAN

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#1. The Precambrian Shield

A person who has flown over the Precambrian Shield many times described it as follows:

The Precambrian Shield is a vast wilderness of lakes, rivers, muskeg, and bush. Nearly one third of its surface is covered with water. The land is usually hilly but there are also vast stretches where it is fairly level. There is little soil, and, from the air you can see rock, sand, or muskeg in the few spots that are not covered by water or evergreen trees.

Flying over the region for a long time can become monotonous. You see water, trees, rocks and more and more of the same thing. With so many lakes below you it is difficult to recognize them unless you watch a map continually and carefully.

The rock of the Precambrian Shield is the oldest known to man. It contains a variety of minerals. Once in a while one may spot a survey camp. Mostly white people search for minerals although sometimes a few Indians and Metis will get jobs helping them. The straight long paths that are cut through the trees are put there to mark the boundaries of mining claims.

Occasionally you can observe mine buildings, lumber camps or villages from the air but the Shield is mostly a vast uninhabited land.

#2 Missionaries

With the first visits of Henry Budd, the Anglican catechist, and the Abbé Thibault of the Roman Catholic Oblate Fathers, in 1840 and 1845 respectively, the religious missions entered the North. Their activities were for the most part complementary to those of the Hudson's Bay Company which preserved a non-sectarian policy. The missionaries--welcomed by the Indians--were very successful in making converts and establishing churches. Indeed, the receptivity of the Crees and the Chipewyans to the new religious ideas and practices suggests that the Indian world-view must have been undergoing a general crisis at that time. Even without the open Indian-white warfare and violence found elsewhere the shocking toll of new diseases, and other changes, had disruptive effects. Many of these changes must have raised doubts among the Indians about the adequacy of old ideas and explanations; it seems likely that they turned to Christianity or an adapted version of it, as has occurred in similar situations throughout the world. In any event, the church mission became, alongside the trading store, the nucleus of the small settlement in the North. And the missionaries brought other services, too. They established schools, introduced medical services, devised phonetic alphabets for Cree and Chipewyan, and taught many people to read and write their own language.

(Buckley, H., Kew, J. & Hawley, J. The Indians and Metis of Northern Saskatchewan. Saskatoon: Centre for Community Studies, 1963, p. 8.)

3. The Indian Way of Life in Northern Saskatchewan

The Indian people have lived in Canada for a long time and have learned their own ways of doing things. Indians were a carefree and happy people who understood and enjoyed the things of nature. The forests and streams provided their living and they learned to accept things as they were. Time was plentiful and no one had to hurry. They hunted and fished only enough to supply their needs. As the animals became scarce with the coming of the white man, the Indian people had to turn to the government for help.

Because the Indian people moved alot, they did not learn to keep many possessions. It was considered right to take and use someone else's belongings. In times of plenty an Indian would share with those less fortunate so that he in turn might be helped in time of need. Even today an Indian who returns with money will help his friends until it is gone. If a person kept things for himself, he was considered a miser and possibly called a "whiteman".

The members of an Indian family worked closely together. The men did the hunting and trapping while the women made clothes, did the cooking, and helped to dress animals and prepare furs. The family always stayed together as they moved about hunting and trapping. They would live near the trading post only for short periods of time. Today in Northern Saskatchewan this has changed and they live in villages most of the year. The men leave their families to operate traplines in winter and spring.

Children had a free and easy time and usually did as they pleased. They were free to get up, go to bed, and eat when they felt like it. Indian children grew up learning not to interfere with others. Everyone was considered to be free to work or live when and where he wished.

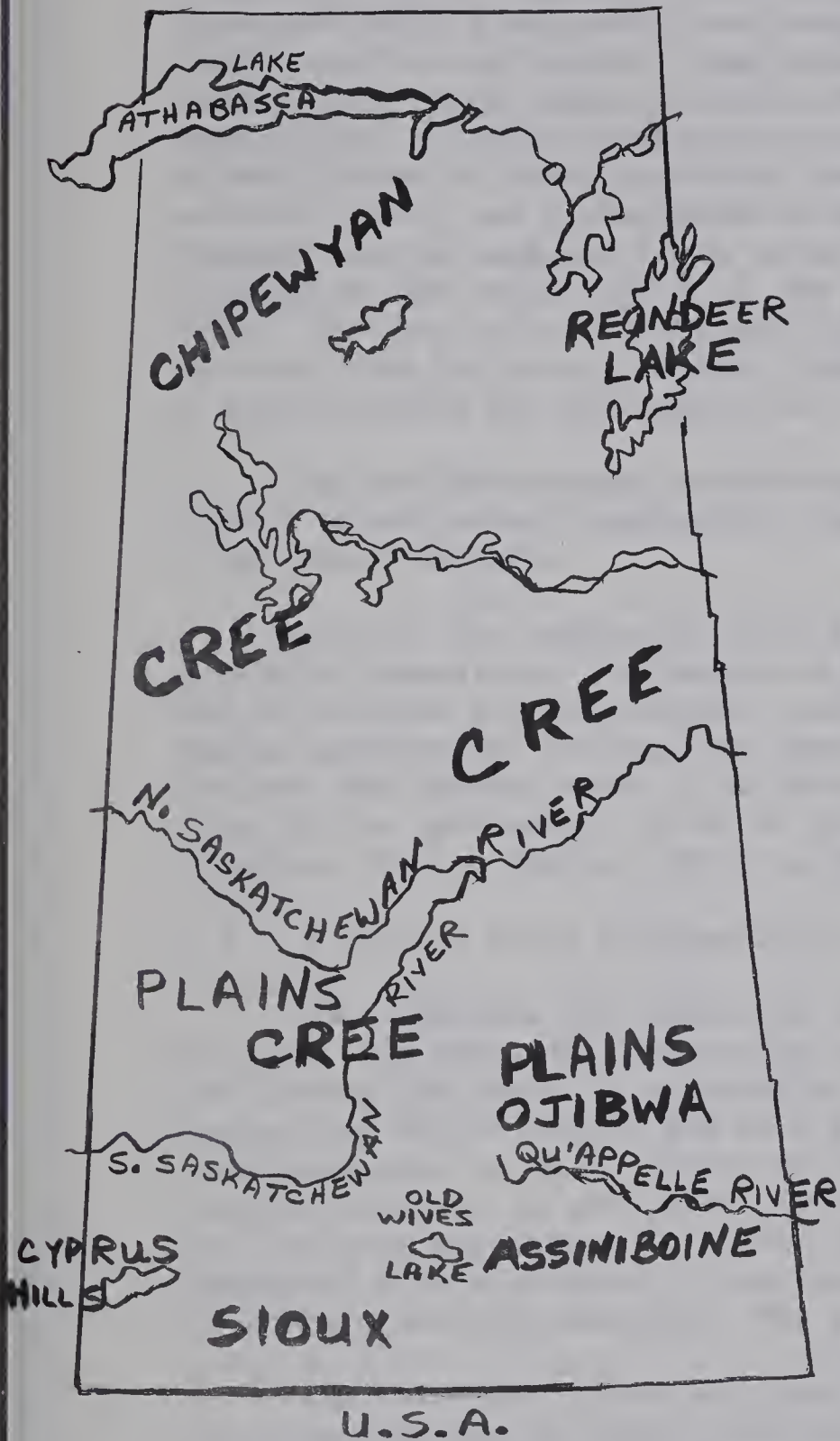
Although Indian men took pride in their hunting and trapping, they were also very humble. When Indians spoke they would look away; this was to show consideration for others. They preferred to give everyone a chance and would not try to be the leader or winner every time. Cooperation was considered much more important than trying to out-do others. Children in school would not try to always give the answer or get the best mark. They would not answer until others had a chance and they would try to assist each other.

4. Tourist Trade--Native Guides.

The tourist industry has created few new jobs for non-whites in the village. (La Ronge) because commercial establishments are mainly staffed by whites. Guiding, the work that does go to Indians and Metis, is not a major industry, let alone a solution for the excess labour force. It employs not more than 25 to 30 men (June and September) as well as intermittently through the summer. These men might average around \$600 a season. Another 40 guides are needed at the peak of activity. Their earnings would average only \$200 to \$300. Guiding is a useful supplement, but not an alternative that could take men out of trapping. It does not supply even supplementary earnings for more than about one-quarter of the La Ronge labour force.

(Buckley et al, 1963, p. 16).

5 Indian Tribes in
Saskatchewan



6. The Chipewyan at Wollaston.

It is interesting to turn to a very different area where again the problem centers on the Indian trapper. In the extreme north-east corner of the province, the trappers are a small nomadic band of Chipewyan for whom trapping is still a way of life. As in the past, they follow the caribou, trapping and selling fur on both sides of the Manitoba border. Their returns from fur, according to the Indian agent, average \$180 a year. Thus, even in the last stronghold of a vanishing era, the trapping industry turns in a very dismal performance.

(Buckley, H. Trapping and Fishing in the Economy of Northern Saskatchewan. Saskatoon: Centre for Community Studies, 1962, p. 48.)

7. Change to Village Life.

Supporting ever-increasing numbers, the traditional economy has been further impaired by new residence patterns. No longer do families work as units, and move together between the trading posts and trapping grounds. In most areas the men make forays away from the settlement where the women and children stay the year round to be near school, store, post-office, and hospital. Settlement life represents a complete break with the past; it tends to diminish the supply of game and fish for the table and to lower the trapper's harvest of fur.

(Buckley, 1962, p. 9.)

8. A Poor Family.

Consider the case of a 32-year old Metis living across the lake from the settlement of Ile-a-la-Crosse. This man, his wife, and eight children ranging in age from one to fourteen years, live in a bare one-room cabin, furnished with a well-used wood range, two wooden chairs, a home-made table, and two old steel-framed beds in which the springs have long been replaced by rough boards. There are two small trunks for clothes and bedding and a single cupboard for storing food and utensils. The man owns a small canoe in poor condition, one used fish net, 30 small traps, a .22 calibre rifle, and a single-barrelled shotgun. The children's scanty clothes are in rags and there is no evidence of spare coats or jackets hanging on the inside walls of the cabin where one would expect to see them. The family's income (cash) during the past year has been \$240 derived from fur plus a monthly family allowance of \$50. This amounts to a total of \$788 for the year--i.e. \$78.80 per head.

The children appear undernourished, with skin sores and excema; they do not attend school regularly. The parents look ten or twenty years older than they are.

Part of the reason why this kind of misery exists lies with the man and wife themselves. He speaks no English, is withdrawn, lacks ambition and initiative for the simplest tasks. He had, at one time, enquired about social assistance, but had not made any application. Our interpreter said the man was fearful that if he received assistance he would be forced to live in the settlement, which he did not wish to do. (Buckley, Kew, & Hawley, 1963, p. 30).

9. A Typical House (Cumberland House)

This two-room log house, 16 feet by 18 feet in size, is set back about 50 feet from the road. The entrance, in the middle of one end of the building and facing the road, is enclosed by a small, frame porch which serves as a protection in the winter and as a place to store firewood, a few tools and sometimes meat or fish. There are windows on each side of the building. The log construction is good--the corners being squared and neatly dove-tailed; and the logs themselves fit close together. Spaces between the logs are plastered with a mixture of clay and grass. The roof is covered with strips of asphalt roofing material. The exterior is unpainted and the lot is not fenced.

The interior is divided into two rooms by a frame partition which does not extend to the ceiling. The back room contains two double beds, a chest of drawers and various boxes for storage. The doorway, covered by a curtain, is simply a gap in the partition.

The larger room contains a wood-burning range for cooking, a table, several wooden chairs, a cot used in the daytime as a couch, and a few rough shelves and cupboards.

In the winter, a tin heater is placed in the larger room as an auxiliary heating unit. The two stoves are served by the same main stovepipe from which the roof is protected by a tin "roof-jack." The floor is of planed boards, part of it is covered by linoleum. The walls are lined with painted cardboard and fibreboard.

This house has six occupants.
(Kew, J.E.M. Cumberland House in 1960. Saskatoon: Center for Community Studies, March, 1962, p. 128.)

10. Housing.

According to a survey of five settlements in 1960-61, the average house could be described as a two-room cabin, about 18 by 20 feet in total dimensions. This house would be occupied, on the average, by six persons. About one-third of the houses in the sample were one-room cabins or shacks, lacking even ceilings. Although in some settlements many houses had electricity, none of the Indian or Metis homes had flush toilets or running water, and only a few were built on adequate foundations. The majority of the houses were equipped with only the simplest heating devices. The cheap "air-tight" tin heater with bare tin stove pipes (a notoriously hazardous combination) is the most common heating equipment in the northern home.

(Buckley, Kew, & Hawley. 1963, p. 25)

11. Fur Returns, and Prices.

FUR RETURNS, BY SPECIES, 1959/60 AND AVERAGE PRICES, 1947/48 and 1959/60
NORTHERN FUR CONSERVATION AREA.

	Value of Production	Average price per pelt	
	1959/60	1947/48	1959/60
Beaver	\$414,669	\$27.36	\$11.17
Mink	404,310	27.16	18.92
Lynx	147,390	16.26	14.07
Muskrat	142,964	2.29	.82
Squirrel	114,962	.39	.38
Weasel	28,534	1.34	.80
Otter	15,485	22.97	22.32
Marten	8,607	26.89	7.74
TOTAL	\$1,276,921		

TOTAL NORTHERN FUR CONSERVATION AREA: \$1,285,675

Source: Statistical Summary, 1959/60 Fur Season, Statistics Division, Wildlife Branch, Department of Natural Resources.

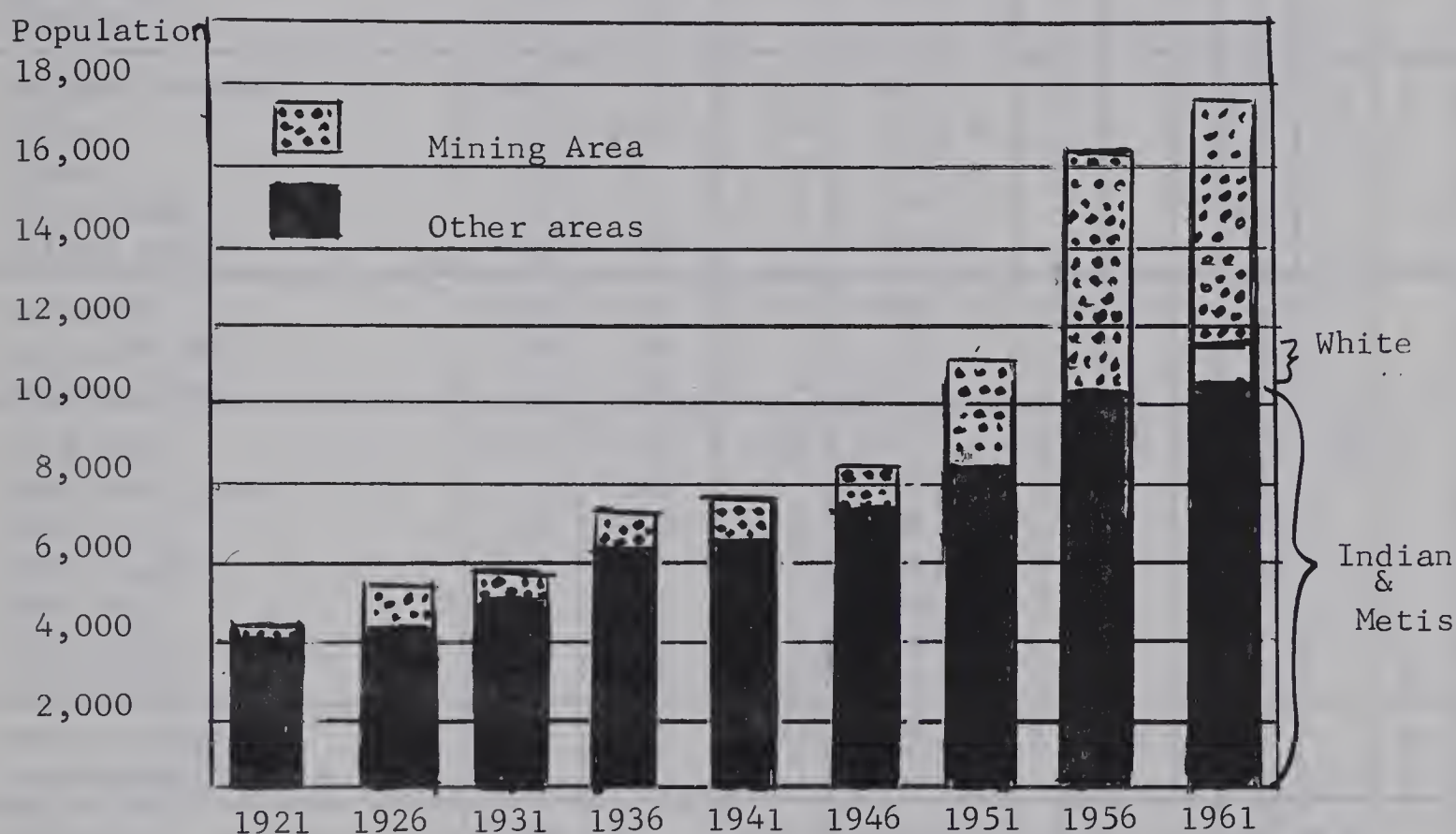
(Buckley, 1962, p. 25.)

12. Health and Medical Problems.

Hospital admissions for vitamin deficiencies and anemia, for example, appeared to be about ten times more frequent in the North. Other diseases prevalent in the North, such as tuberculosis, pneumonia, respiratory disorders, skin infections, etc., are associated with poor sanitary facilities, crowded or inadequate housing, and in part with nutritional problems as well.

(Buckley, 1963, p. 26).

13. Population of Northern Affairs Region.



(Buckley, 1963, p. 12.)

14. Reason for Population Increase.

In the past, as in other under-developed regions, population increase was held in check because high death rates tended to offset the high rate of births. This is not the case in Northern Saskatchewan today. Mortality rates have fallen significantly, a trend directly attributable to the provision of better medical, hospital and welfare services. The decline in mortality has been particularly marked within the past ten years. Infant mortality, for example, has decreased by 50 per cent since 1950.

(Buckley, 1963, p. 12.)

15. POPULATION & SERVICES OF SETTLEMENTS IN NORTHERN AFFAIRS REGION 1961-62

Settlement (grouped by D.N.R. adminis- trative districts.)	Population				Administrative & Commercial Services									
	Metis	Indian	White	Total	School	Hospital	D. N. R.	Indian Affairs	R.C.M.P.	Mission	Stores	Misc.	Business	Filleting Plant
Beauval	479	18	29	526	x			x		x	3	1		
Ile-a-la Crosse	514	18	50	582	x	x	x	x	x	x	2	2		
Ile-a-la-Crosse Dist.	229	-	26	255										
Patuanak	50	102	2	154						x	2			
Dipper Lake	28	53	-	81										
Pine River	14	30	-	44										
Primeau	21	23	-	44										
Buffalo Narrows	591	12	197	800	x	x	x		x	x	3	11	x	
Dillon	86	222	10	318	x					x	1			
Michel	43	-	5	48	x									
Clear Lake	51	62	5	118	x					x	2			
Island Lake	40	14	-	54										
La Loche	748	104	32	884	x	x	x				2	1		
La Loche West	55	20	-	75										
Garson Lake	37	30	-	67										
La Ronge	373	700	379	1452	x	x	x	x	x	x	3	30	x	
Nemeiben River	-	100	-	100										
Stanley	100	610	8	718	x						2			
Otter Lake	-	-	10	10							1	3		
Duck Bay	25	3	-	28										
Cree Lake	38	15	6	59									x	
Pinehouse	290	12	10	312	x						1		x	
Pelican Narrows	93	510	25	628	x	x	x	x		x	3		x	
Deschambault Lake	16	160	7	183						x	1		x	
Creighton	20	-	2267	2287	x		x		x	x	?	N.A.		
Denare Beach	22	75	62	159	x		x				1		x	
Beaver-Flin Flon Dist.	16	1	129	146										
Sandy Bay	464	50	18	532	x	x	x		x		2	1		
Island Falls	-	-	185	185	x				x		2			
Cumberland House	388	17	48	453	x	x	x		x	x	2	2		
Pemmican Portage	226	11	10	247	x					x				
Pine Bluff	3	71	1	75	x									
Sturgeon Landing	50	43	9	102										
Kinoosao	73	-	27	100	x		x				1		x	
Southend	78	278	4	305	x					x	1			
Wollaston Post	43	187	10	240	x					x	1	1	x	
Stony Rapids	72	-	37	109	x	x	x	x	x	x	1	1		
Black Lake	23	278	4	305	x					x	1			
Stony Lake	-	64	-	64										
Fond du Lac	6	332	4	342	x					x	1			
Camsell Portage	66	-	7	73										
Uranium City & Dist.	50	76	3180	3306	x	x	x		x	x	6	40+		
TOTALS	5521	4243	6806	16570										

(Buckley, 1963, p. 107.)

16. Activities of Five Trappers (Cumberland House)

To illustrate more fully the pattern of trapping, we describe here several different examples of trapping activity in A-28.

About 15 A-28 trappers from Cumberland House are active in the entire winter season from mid-November to Christmas or New Year's. Most of these men make a brief sortie after New Year and return during the excessively cold periods in late January and February. Mink, the highest price winter fur, is then past its prime condition and long-haired furs such as foxes are beginning to deteriorate in condition.

Trapper A traps alone in one of the most distant zones from Cumberland House (about 55 air miles Northwest). He keeps the bulk of his traps at his trapping cabin and needs to transport only newly-purchased replacements. However, when he departs his canoe contains an impressive load: grub, bed-roll, tent, utensils, outboard gasoline, coal-oil (for lamps), dog sleigh, four dogs, harness, fish-net, rifles, etc. He travels by canoe for several days to his trapping area. After freeze-up he begins his trapping, travelling both on foot and by dogteam. Before Christmas, or during the week between Christmas and New Year's, he returns to Cumberland House by dogteam. He sells his catch, enjoys for a brief while the company of friends and the conviviality of the holiday season, then purchasing another grubstake, he returns to his trapline. The extent of his mid-winter trapping depends on weather condition, the price of fur, and the supply of animals in his area. He may return in January or February to Cumberland House and stay there for a number of weeks. However, by March or early April he returns to his trapline by dogteam and prepares for the spring trapping season. When this is finished, his beaver and muskrat harvest over, and the waterways again open, he returns by canoe to Cumberland House. This man's yearly trapping income for the last two seasons has averaged \$396.

Trapper B's trapline is much closer to Cumberland House. He may make two or more canoe trips to his camp while preparing for the trapping season. Just before freeze-up or before the trapping season starts, he makes his final canoe trip of the year. B is accompanied by his wife who does the cooking, housekeeping and much of the pelt preparation. The couple stay out until Christmas time, although they may make a brief visit to Cumberland House by dogteam. Trapper B has averaged \$1,059 yearly in the last two seasons.

Trapper C is a member of a zone even closer to Cumberland in which there are more than ten active trappers. C shares a rough cabin with two other Cumberland men. He does not move his gear to his line before freeze-up or spend much time preparing for the season's activity. When it is safe to travel by dogteam, he travels to his camp (less than one day's travel distance) with his equipment and enough grub for a week. He sets out his traps and tends them regularly, although he usually returns to Cumberland for a day or two each week. When the catch of mink and other fine furs has diminished to the point where it is unrewarding to continue trapping, or when the Christmas festive season begins, Trapper C lifts his traps and returns to Cumberland House. After New Year he may set a few traps or snares for lynx and foxes. But most of his activity will be concentrated upon cutting and hauling firewood until the beaver season approaches in March. At that time he will go out to his line by dogteam. He carries a small canoe with him, or makes

arrangements to share the use of one already there. He usually stays out on his line during the whole of the spring season, until he has trapped all the animals his area can stand, or until he finds it unproductive to trap more. This man's annual trapping income has averaged \$290 for the last two years.

Trapper D is in a zone about 20 miles from Cumberland House. There are four active trappers, two of whom are D's grown sons. The latter trap only in the springtime, however, and D traps alone in the winter season. Like Trapper C, D travels out with his equipment and grub by dogteam after freeze-up. However, D usually stays out on his trapline for lengthy periods of time before Christmas, making no more than one or two trips to Cumberland House. After Christmas, like most other trappers, his trapping activity is curtailed. When the spring season approaches, he goes out by dogteam and begins trapping. When the rivers open, one of his sons goes out to the camp by canoe, bringing D's wife or an older daughter. The camp is then for a brief period of ten days to two weeks a hive of activity, with three trappers killing muskrats and one or two women preparing pelts. The return to Cumberland House is made by canoe. This man's average yearly income from trapping for the last two seasons was \$479.

Trapper E is in another zone close to Cumberland House. E's son-in-law is the only other trapper in the zone. They both stay in E's cabin when on their lines; but trap independently. E begins his winter trapping after freeze-up by travelling out to his zone by dogteam and spending four or five days setting his traps. After visiting the sets once, he returns to Cumberland House for two or three days and then goes back to his trapline for one or two days. During the entire winter season, he follows this pattern of movement to and from his trapline. During the time he spends at Cumberland House, E cuts and hauls cordwood. In the period after New Year, he does very little trapping. He may set a few snares for lynx or fox, but tends them less frequently than mink sets in the pre-Christmas season. By February, his trapping activity has ceased and he devotes his time to wood-hauling or other tasks in Cumberland House.

E begins muskrat trapping as soon as break-up occurs and usually takes his wife out to his cabin to assist in pelt preparation. This man's average yearly trapping income for the last two years has been \$639.

(Kew, Cumberland House in 1960, p. 132-133)

17. Cost of Trapper's Equipment.

The list which follows sets down the basic equipment which a good trapper could be expected to possess, and the approximate cost.

4 doz. small traps @ \$9.50 per dozen	\$38.00
6 large traps (beaver) @ \$3.00 each	18.00
50 snares	10.00
5 dogs, average \$20 each	100.00
5 sets harness @ \$10 each	50.00
1 12-foot toboggan	36.00
.22 rifle	14.00
campstove	16.00
tent	35.00
	<u>\$317.00</u>

(Buckley, 1962, p. 41.)

18. TRAPPING INCOMES OF ACTIVE TRAPPERS, BY INCOME GROUPS,
NORTHERN SASKATCHEWAN, 1958/59 and 1959/60.

Income Group	1958-1959		1959-1960	
	Number	Percent	Number	Percent
\$ 0 - 499	1,294	75.9	1,075	63.2
500 - 999	341	20.0	456	26.8
1,000 - 1,499	56	3.3	123	7.2
1,500 - 1,999	8	.5	33	1.9
2,000 plus	<u>5</u>	<u>.3</u>	<u>16</u>	<u>.9</u>
	1,704	100.0	1,703	100.0

(Source: Ledgers of the Statistics Division, Wildlife Branch, Sask.
Department of Natural Resources.)

(Buckley, 1962, p. 153).

19. Fishermen's Expenses.

The capital costs of fishing are surprisingly high. Even more than trapping, fishing takes money for a man to get started, and considerable outlays are required thereafter. The cost of a one-man outfit, estimated roughly, is as follows:

10 nets	\$ 300
Floats and other accessories	200
Boat	250
Motor (5 h.p.)	275
Supplies, including gas, license	<u>50</u>
	\$1075.

(Buckley, 1962, p. 90).

20. TOTAL CATCH AND AVERAGE PRICE IN CENTS PER POUND, MAJOR SPECIES
SASKATCHEWAN.

Year	WHITEFISH		TROUT		PICKEREL		PIKE	
	pounds in thousands	average price	pounds in thousands	average price	pounds in thousands	average price	pounds in thousands	average price
1957	6,423	9.3	1,730	8.7	1,358	9.4	763	4.3
1958	6,815	9.2	1,980	10.3	1,544	10.8	1009	4.0
1959	6,867	9.7	1,839	9.2	1,636	15.4	1231	4.6

(Buckley, 1962, p. 169).

21. Methods of Fishing.

Northern fishing takes in a great variety of operations. The "fisherman" may be only a lone Indian with canoe, motor and five nets. At the other extreme, he owns a large boat and employs as many as four helpers. Since the license allows the use of ten nets, a large operator could reap the yield of 40 to 50 nets. Such a large-scale operation, however, is rare. At La Ronge, which is typical of many lakes, few fishermen employ wage labour. Although most men have their own small boat, many do not own nets and are fishing on shares. There are men with 20 nets and a helper; there are partners each supplying 10 nets; there are men with fewer nets, fishing alone or with wives or boys as unpaid helpers.

(Buckley, 1962, p. 76).

22. Fishermen's Earnings.

The table below is a rough guide to the earnings of East-side fishermen. All helpers have been placed in the under-\$500 category. Earnings over \$2,000 have been adjusted for wages of helpers.

Distribution of Earnings of 423 East-Side Fishermen, 1959/60.

	Number	Percent
Under \$500	254	60.1
\$500 - 999	66	15.6
1,000 - 1,499	42	9.9
1,500 - 1,999	25	5.9
2,000 - 4,999	29	6.9
\$5,000 and over	<u>7</u>	<u>1.7</u>
TOTAL	423	100.1

(Buckley, 1962, p. 85).

#23. Mink Ranching.

The North offers this industry several important advantages: the climate produces a good pelt, and there is an abundant supply of cheap food. The cost of feeding mink in the North is well below the cost on southern ranches, and nutritionally, the fish diet has proven satisfactory. On the basis of resources--notably, fish for feed-- northern mink ranching could be very substantially expanded...

In the whole of the Northern Region, only five lakes are presently supplying fish for ranchers. Both at Churchill Lake and Ile-a-la-Crosse, where the largest concentration of ranchers is found, the mink population is only three-fifths of the quotas set to protect commercial fishermen; at the other three lakes, ranching has made but a small beginning. Elsewhere, coarse fish (such as cisco) simply goes unharvested. Since coarse fish are much more plentiful than commercial species (whitefish, pickerel, trout, northern pike), the absence of mink ranches entails an enormous waste of resources.

(Buckley, 1963, p. 47).

24. Cumberland House Annual Work Cycle.

Time	Employment for Cash	Domestic Employment
January-Late March	-a little trapping	-fuel--wood cutting and hauling
Late March-end of break-up (early May)	-muskrat and beaver trapping	
May-June	-commercial fishing -some wage labour outside community	-gardening
July-August	-peak of wage labouring outside -some commercial fishing	-hay making
September-October	-some wage labouring -guiding hunters -a little commercial fishing	-hunting moose and wild fowl
November-December	-trapping of fine furs (mink, ermine, etc.)	-moose hunting -wood-cutting

(Kew, 1962, p. 32).

25. EARNINGS OUTSIDE FISH AND FUR, 83 MEN AT PELICAN NARROWS

Type of work	Number	Range of Earnings
Store Clerk	1	\$2,100
Caretaker	2	1,500 - 4,900
D.N.R. -steady	3	500 - 1,170
-casual	8	6 - 600
Church construction	9	32 - 600
Hauling wood	1	650
Fire Fighting	67	6 - 128
Outside community	19	100 - 1,200
TOTAL ABOVE	<u>110</u>	

(Source: 1961 Household Survey

Note: Total includes some men with more than one job.

(Buckley, 1962, p. 131).

26. Pelican Narrows Occupations.

At Pelican Narrows, 55 air miles from Flin Flon and two days by canoe from La Ronge, most men derive the major portion of their earnings from trapping. In the summer of 1961, we determined the occupational pattern for 101 men, approximately 90 percent of the male labour force as follows:

Trappers	
-with no other earnings	14
-with other earnings	84
Non Trappers	3
TOTAL	<u>101</u>

(Buckley, 1962, p. 130)..

27. Number of Male Workers, Median Age, Kinds of Work and Median Income* by Class of Work--Metis-Indians. (Cumberland House).

Class of Work	No. of Male Workers	Median Age	Mean No. Kinds of Work*	Median Income
A. Permanent Full-time Jobs	5	42	1.	\$2,400
B. Traditional Industries (Trapping and/or fishing)	7	56	1.6	700
C. Settlement work (casual labour and/or self-employment in settlement)	8	52	1.8	475
D. Outside work	4	31	1.	1,275
CD. Settlement Work and Outside work	5	23	2.2	1,600
BC. Traditional Industries and Settlement Work	7	60	3.	1,000
BD. Traditional Industries and Outside Work	15	34	2.5	1,000
BCD. Traditional Industries, Settlement Work and Outside Work	<u>16</u>	<u>41</u>	<u>4.</u>	<u>1,400</u>
TOTALS	67	42	2.5	\$1,075

*Eight kinds of work were defined: 1. hunting 2. fishing 3. casual labour outside the community 4. casual labour inside the community 5. permanent full-time jobs 6. guiding 7. cattle-raising 8. self-employment in services: water carrying, wood-cutting, etc.

Source: 1960 Household Census
(Kew, 1962, p. 67).

APPENDIX D

THE CRITICAL THINKING IN SOCIAL STUDIES TEST

GUIDE FOR ADMINISTERING
THE CRITICAL THINKING IN SOCIAL STUDIES TEST

Introduce the test to the class as follows: "This is a test to see how carefully you can THINK. You will not be required to use information learned in school subjects.

You will need three things to do this test: 1. The HB pencil that has been given to you. Return the pencil at the end of the last test. 2. A separate answer sheet on which you will mark ALL of your answers. If you change answers erase the first one carefully. Do not make any other mark on your answer sheet. 3. A Test booklet--Do not put any marks on it.

Hand out the answer sheets and check that each student has an HB pencil. Have the students fill in the spaces for name, grade (year), age, school, and teacher on the answer sheet.

Hand out the test booklets. Tell the students to keep them face down. When everyone has a booklet, ask the class to turn to Part 1. Read the directions on Page 1 out loud as the students read them to themselves. Do likewise for the sample and number one below it.

Ask all students to mark the answer to number 1 on the separate answer sheet. Check that they understand how it is to be done.

When all have marked their answer sheets, say: "The correct answer for (1) is B. It is likely that he is curious about unknown parts of the country if he is curious about the north, but you cannot be certain from the facts that are given."

Have them do number 2 and when finished, say: "The correct answer for statement 2 is A. You can prove from "trip to the North" and "wanted to learn more about this part of the country" that the statement is true.

Ask the class to find and mark the answer to number 3. Then continue: "The correct answer for statement 3 is D. There is nothing in the paragraph that will help you decide if this is A, B, or C."

Proceed with number 4. After the class has marked the answer, say: "The correct answer for statement 4 is C. It is probably false that his family was interested in the trip since they told him that his plan was foolish."

After the children have marked number 5, say: "The correct answer for statement 5 is D. The paragraph does not mention how cold it was. Although you know that the statement is TRUE you do not have any facts about it in the paragraph and you cannot tell."

State that they are to check their answers and also to check the marks for neatness if they finish before time is called.

Ask the class if there are any questions. Assist those requesting

guidance as to how they are to proceed. Then tell the class to BEGIN and work until they come to STOP at the end of Part 1. (Number 45 on page 5.)

ALLOW 27 MINUTES

Have the children turn to Part 11 on page 6. Read the directions out loud as they read them. Do likewise for the sample and have them mark the answer for number 46 on the answer sheet. Then continue: "In 46, B is correct because the writer assumes this is true or it would make no sense to say that we should use it rather than other brands."

Have them do number 47. Say: "In 47, A is correct because he tells us that this is so in the ad. Ingredients X-13 and Z-002 are given."

Go on to number 48. Then say: "In 48, C is correct because the writer does not assume this nor does he give it as a fact."

Ask if there are any questions and briefly indicate the correct procedure if needed. Remind them to mark only one choice for each item and to make their marks neat.

Tell them to BEGIN Part 11, and do the questions on pages 6 and 7 ending with number 68.

ALLOW 10 MINUTES

Ask all students to turn to Part 111 on page 7. Read the directions and the sample out loud. Ask them to do number 69. When they have done so, say: "Number 69 is A because the statement is a reason for having a longer recess."

After the class has marked the answer for number 70, tell them: "The answer for number 70 is B. This is a reason for not taking school time to make recesses longer."

Have them continue with Number 71. When they have done so, say: "Number 71 is C because the statement is neither for nor against longer recesses."

Briefly clarify any procedures about which the students are uncertain. Tell them to check all answers and to make sure that there is only one answer marked for each number and that it is neat and dark. Tell them to BEGIN Part 111 and work to the end of the test.

ALLOW 10 MINUTES

THE CRITICAL THINKING IN SOCIAL STUDIES TESTPART 1 DRAWING CONCLUSIONS FROM FACTS.

In each of the following exercises you will find a paragraph, graph, or chart and five numbered statements below it. Each statement is a conclusion that someone else made after reading the facts found in the paragraph, graph, or chart. Show what you think of the statement that someone else made by marking the letter that indicates your answer. Mark only ONE letter for each numbered statement.

- MARK: A. TRUE -if you can prove that the statement is true from the facts that are given in the paragraph.
- B. PROBABLY TRUE -if the statement could be true according to the facts in the paragraph but you cannot prove it.
- C. FALSE OR PROBABLY FALSE -if the statement says something that does not agree with the facts given.
- D. CANNOT TELL -if there is nothing in the paragraph, graph, or chart to help you to decide if the statement is either A, B, or C.

REMEMBER: Choose your answer according to the information that is given here and NOT from what you have learned someplace else.

SAMPLE:

An author wrote this when telling about his travels.

"I was living in Saskatoon when I decided to take a trip to the north. I took the trip because I wanted to learn about this part of the country of which little is known. Therefore, I took my trip, although my parents, brothers and sisters, and friends, all told me again and again that my plan was foolish."

1. The author was curious about unknown parts of the country.
2. The author intended to find out about the North.
3. The author had lived in Saskatoon for five years.
4. The author's family was interested in the trip he was to take.
5. The climate in the North was colder than in Saskatoon.

BEGIN Number 6 when your teacher tells you to do so.

REMINDER: Choose your answer from the information given here.

MARK: A. TRUE
B. PROBABLY TRUE

C. FALSE OR PROBABLY FALSE
D. CANNOT TELL

Pioneer families in southern Saskatchewan often lived in sod houses. They made many of the tools that were used. They had to travel long distances to the nearest store. Wheat, which grew well on the prairies, was the main food besides wild berries and game that the men hunted. Winter blizzards piled up huge drifts of snow and made it difficult to travel.

6. Most of their tools were bought from a store.
7. Many buffalo roamed the prairies.
8. The pioneer families had few visitors in winter.
9. Pioneer homes in southern Saskatchewan were simple and crudely made.
10. Pioneer boys liked to go hunting.

At Estevan, bricks are made from clay. The clay is shaped and heated to a high temperature in a kiln. The bricks are very hard. They will not decay or burn as wood does, and will last for hundreds of years. They come in different colors and are not costly. These qualities make bricks very useful in building.

11. Yellow bricks are used in buildings most of the time.
12. Bricks are made at other places in Saskatchewan.
13. Clay is heated to several hundred degrees Fahrenheit in the kiln.
14. For outside surfaces, bricks have more lasting qualities than wood.
15. Bricks show signs of wearing away in several years.

REMINDER: Choose your answers from only the information given here.

MARK: A. TRUE B. PROBABLY TRUE C. FALSE OR PROBABLY FALSE D. CANNOT TELL

Regina is located on Wascana Creek on the Western Prairies. The land is level and one can see for many miles in one direction. Wheat is an important crop. Saskatoon is on the South Saskatchewan River and is in the Parklands region. Mixed farming is more common because the land is rolling and there are bluffs of trees. Prince Albert is on the North Saskatchewan River and is the gateway to northern Saskatchewan.

16. Saskatoon is the largest city in the Parklands.
17. The towns near Regina have many grain elevators.
18. There are clumps of trees near Saskatoon.
19. Prince Albert is in the Parklands.
20. Wascana Creek flows among hills for most of its length.

Industry in Saskatchewan, in 1958, produced products of the following values:

Slaughtering and meat packing	\$47,338,510
Petroleum products	82,409,038
Butter and Cheese	34,452,627
Flour	41,025,500
Bread and other bakery products	10,778,823

21. In 1957 the value of slaughtering and meat packing products was greater than that for bread and other bakery products.
22. The value of slaughtering and meat packing products is increasing.
23. The value of butter and cheese is about three times as great as that for bread and other bakery products.
24. The value of flour was less than petroleum products in 1959.
25. All of the flour that was produced in Saskatchewan was used in

making bread and bakery products.

REMINDER: Choose your answers from the information given here.

MARK: A. TRUE B. PROBABLY TRUE C. FALSE OR PROBABLY FALSE D. CANNOT TELL

A \$65,000,000 pulp mill near Prince Albert was completed in 1968.

Roads were built to the areas of forest north of Prince Albert for trucks to haul pulpwood to the mill. Many men find work in the mill and in the forest cutting down trees. The mill produces about 650 tons of pulp per day. Paper that is made from the pulp is sold in other countries.

26. Most of the roads built for the "pulpwood" trucks run in a northerly direction.
 27. Canada produces more pulp than it needs.
 28. People of the north now find it easier to get work.
 29. The trees in the forest north of Prince Albert are not good for pulpwood.
 30. They began to build the pulp mill in 1967.
-

Petroleum and natural gas are obtained from rock far below the surface in the southwestern and southeastern areas of Saskatchewan and near Lloydminster. The petroleum and natural gas are found in certain types of sedimentary rock. This type of rock contains sandstone, shale, and sometimes limestone. The only sure way of finding out if there is petroleum in the rock below is to drill an oil well. This takes time and is expensive because many times petroleum is not found in the well.

31. Petroleum and natural gas are found in all types of sedimentary rocks.
32. There are oil wells in southwestern Saskatchewan.
33. Petroleum companies search for areas which have sandstone, shale, or limestone rocks.
34. Petroleum and natural gas are refined in Saskatoon.
35. There are several ways of being certain that there is petroleum under the surface.

GO ON TO THE NEXT PAGE

REMINDER: Choose your answers from only the information given here.

MARK: A. TRUE B. PROBABLY TRUE C. FALSE OR PROBABLY FALSE D. CANNOT TELL

Farmland surrounds most of the towns and cities in Saskatchewan. Wheat and other grains are the main crops grown. Most farms are less than fifteen miles from a railway. Saskatchewan has more rail-mileage than any other western province. Towns can be seen from some distance because the grain elevators tower above the houses and stores. The elevators store grain until trains haul it away to ports. There it is stored until it is loaded on to ships. Wheat is sold to many other countries.

36. There are railway cars for carrying grain.
37. Grain elevators are equipped to load train boxcars.
38. Saskatchewan has more rail mileage than Ontario.
39. Farm trucks haul grain long distances to the nearest elevator.
- 40.. Oats and barley are grown on the farms.

This graph shows how many people lived in rural and urban areas in Saskatchewan in three different years.

THE POPULATION OF SASKATCHEWAN

	RURAL (farms)		URBAN (cities)
1961	530,000	1961	395,000
1956	558,000	1956	322,000
1951	579,000	1951	252,000

41. In Saskatchewan in 1954 more people lived in rural than in urban areas.
42. The urban population of Saskatchewan increased by about 130,000 from 1951 to 1960.
43. In Saskatchewan in 1958 more people lived in urban than in rural areas.
44. The number of people in the rural areas of Saskatchewan was the same in 1961 as in 1955.
45. In Saskatchewan in 1956 most of the people in rural areas worked on wheat farms.

STOP!! END OF PART ONE. WAIT FOR FURTHER DIRECTIONS!!!

PART 11. Basis for an Argument.

Each of the following paragraphs contains a few sentences, one of which is a conclusion that something should be done. Each argument is followed by 5 numbered statements. Decide how the numbered statement fits into the argument. Mark your choice as follows:

MARK: A. FACT -if you can tell this is so from what the writer says.

B. ASSUMPTION -if the writer does not say this but shows from his conclusion that he must believe it is true.

C. CANNOT TELL -if the statement is neither given as a fact in the argument nor is it something that is assumed.

SAMPLE: An advertisement read:

X-rez is the newest cough remedy out. It contains sodium citrate and the secret ingredients X-13 and Z-002. You get immediate relief or your money is refunded.

CONCLUSION: X-rez is the best cough syrup money can buy.

46. X-rez will cure a cough more quickly than other brands of cough syrup.
47. X-rez contains a special ingredient.
48. Science is investigating cough remedies.

Saskatchewan has fourteen provincial parks, one national park, and thirty-seven regional parks. Thousands of people visit these parks each summer and many bring tents, tent trailers, and trailers. Having many tourists helps the province of Saskatchewan.

CONCLUSION: The government should build more camping grounds for the many visitors who come to Saskatchewan.

49. There are not enough camping grounds in Saskatchewan at present.
50. Northern Saskatchewan has many provincial parks.
51. The parks in Saskatchewan are operated by different governments.
52. More tourists will come if we have more camping grounds.
53. Many people come to visit our parks.

GO ON TO THE NEXT PAGE.

MARK: A. FACT B. ASSUMPTION C. CANNOT TELL

Farming has changed greatly in the last thirty years. Machines and a few men do the work once done by many men and they do it faster. Large farms are better able to buy machines and to make a profit. The farms should be made larger. The number of farms decreased from 103,000 in 1956 to 93,924 in 1961.

CONCLUSION: The families on small farms should move to the cities so that the others would have more land.

- 54. Several thousand people moved to the towns.
 - 55. Some people have left the farms already.
 - 56. In 1964, 348,000,000 bushels of wheat were produced in Saskatchewan.
 - 57. There is no reason why we should have small farms.
 - 58. Machines make it possible to have larger farms.
-

Potash was found in central Saskatchewan twenty years ago. The deposits lie from 2,500 to 8,000 feet below the surface, and one mine may cost as much as \$40,000,000. In 1964, only three mines were producing potash. These were operated by companies. The sale of potash makes Saskatchewan a richer province. We need more potash mines.

CONCLUSION: The Government of Saskatchewan should help companies to build more mines.

- 59. More companies would build potash mines in Saskatchewan if they were helped.
 - 60. It is expensive for a company to build a potash mine.
 - 61. The companies will be able to sell the potash from the new mines.
 - 62. There are two ways of mining potash.
 - 63. There is enough potash below the surface for more mines.
-

GO ON TO THE NEXT PAGE.

MARK: A. FACT B. ASSUMPTION C. CANNOT TELL

Forest covers much of northern Saskatchewan. Lumber is needed for building houses there and in towns and cities further south. Many men in this region cannot find work to support their families.

CONCLUSION: Sawmills should be built to produce lumber and give work to the men.

64. There is a way to ship the extra lumber to cities.

65. Many of the trees are large enough to be cut into lumber.

66. This area needs industries to give work to more men.

67. Forests provide pulpwood for making paper.

68. The men know how or can be shown how to work in a sawmill.

STOP!! WAIT FOR FURTHER DIRECTIONS!!!

PART 111 Support for an Argument.

Read each paragraph and the numbered statements below it. Do NOT try to decide if you agree or disagree with the conclusion or statements. Only mark the statements as you are directed.

For each numbered statement mark only ONE of the following:

- MARK: A. SUPPORTS - if the statement makes the argument stronger and people are more likely to be "for it".
- B. WEAKENS - if the statement makes the argument weaker and people are more likely to be "against it".
- C. NEITHER A NOR B. - if the statement does not strengthen or weaken the argument.

SAMPLE:

Children should play outside in the fresh air. It is often too cold to play outside in winter. In spring the weather becomes much warmer.

CONCLUSION: In April, May, and June school recesses should be made longer.

- 69. Children require fresh air and sunshine for their health.
- 70. Children should not have any less time for school work.
- 71. Children ride bicycles to school in spring.

Some families do not have enough money and live in broken-down crowded houses. They should be given help.

CONCLUSION: These families should be given better houses even though they cannot pay for them.

- 72. Children from better houses are healthier.
- 73. Poor people do not know how to take care of a house.
- 74. Someone has to pay for the houses.
- 75. Brick houses are usually more expensive than wooden houses.
- 76. A city is more beautiful if there are no tumbledown houses.

GO ON TO THE NEXT PAGE.

REMEMBER!! MARK: A. SUPPORTS THE ARGUMENT
 B. WEAKENS THE ARGUMENT
 C. NEITHER A NOR B

Uranium City is near Lake Athabasca in the northernmost part of Saskatchewan. There is no road to Uranium City.

CONCLUSION: A highway should be built from Prince Albert to Uranium City.

77. It is difficult to build roads in Northern Saskatchewan.

78. It is expensive to carry supplies by airplane from Prince Albert to Uranium City.

79. In 1964 there were 8,924 miles of provincial highway in Saskatchewan.

80. Trucks from Prince Albert want to get pulpwood from northern Saskatchewan.

81. There are not enough people in northern Saskatchewan to use the highway.

In recent years, it has become difficult for Western provinces to sell all of the wheat that is grown. The farms should grow less wheat.

CONCLUSION: The farmers of Saskatchewan should use more land for raising livestock (cattle) and less for raising wheat.

82. China and other countries of Asia may buy much of our wheat.

83. Combines are used to harvest the wheat crop.

84. Livestock products **are** easily sold to distant cities.

85. Raising livestock involves more hard work than growing wheat.

86. The total farm income from wheat was less in 1961 than in 1960.

GO ON TO THE NEXT PAGE.

Iron ore was discovered south of Choiceland which is east of Prince Albert.

CONCLUSION: A company should construct buildings and mine the iron ore.

87. The iron ore is far below the surface.
 88. The IPSCO plant 200 miles away at Regina needs iron to make pipes.
 89. There is no town where the iron ore was discovered.
 90. It is believed that the iron ore is of poor quality.
 91. Saskatchewan buys iron from other provinces.
-

END OF TEST.

Check your answer sheet carefully. Make certain that all of your answers are NEAT and DARK. Erase any errors you may have made.

APPENDIX E

ACHIEVEMENT TEST

ACHIEVEMENT TEST -- VILLAGES OF NORTHERN SASKATCHEWAN

DIRECTIONS: Read each question carefully and decide which ONE of the four choices is the best answer. Mark the letter of the best answer on the separate answer sheet. REMEMBER!! Mark only ONE answer for each question. DO NOT MAKE ANY MARKS IN THIS BOOKLET.

EXAMPLE:

1. The main tree found in the forests of Northern Saskatchewan is the:

- A. poplar
- B. spruce
- C. maple
- D. elm

WAIT UNTIL YOU ARE TOLD TO BEGIN.

2. The Indians and Metis may look upon money, time, and what is good or bad differently than we do. An explanation for this is:

- A. they live in a part of Canada where few white people live.
- B. they have occupations different from ours.
- C. they did not always know how to read and write English.
- D. they have lived a different way of life for hundreds of years.

3. In what way was the north of more than thirty years ago different from today?

- A. It contained few white people and some stores.
- B. The native people moved frequently to find better hunting and trapping.
- C. It was a region of forests, lakes, and streams.
- D. Moose and caribou were plentiful and easily hunted.

4. The main agency that looks after conservation and the affairs of villages in the north is:

- A. the Royal Canadian Mounted Police.
- B. the Hudson Bay Store operator.
- C. the Fur Marketing Board.
- D. the Department of Natural Resources.

5. The maintenance of law and order in many villages is difficult because:

- A. there is only one policeman in each village.
- B. there are R. C. M. P. detachments in only the larger villages.
- C. villages cannot afford to hire policemen.
- D. no-one wants to be a policeman.

6. In winter most of the native homes are heated by means of:
- A. a tin wood heater.
 - B. an oil stove.
 - C. a coal stove.
 - D. a fireplace made of stone.
7. The patterns that are found on moccasins and mukluks contain designs that look like:
- A. pictures of dogs.
 - B. pictures of flowers.
 - C. pictures of caribou.
 - D. pictures of beaver.
8. Aircraft usually do not visit the remote villages during the months of:
- A. November and April.
 - B. July and January.
 - C. June and February.
 - D. March and October.
9. The religious beliefs of the native people of Northern Saskatchewan can be described as follows:
- A. they worship the Great Spirit as their forefathers did.
 - B. they have few religious beliefs.
 - C. they worship the spirits of their ancestors.
 - D. they worship God as Christians.
10. The following wildlife is found in Northern Saskatchewan:
- A. Beaver, Moose, Wolves, Bear, Ptarmigan.
 - B. Wolves, Fox, Otter, Badger, Lynx.
 - C. Mink, Muskrat, Deer, Antelope, Fox.
 - D. Moose, Wolves, Beaver, Reindeer, Ducks.
11. In Northern Saskatchewan the main types of fish caught for sale in stores are:
- A. Whitefish, Sturgeon, Pickerel, Jackfish.
 - B. Cisco, Whitefish, Trout, Jackfish.
 - C. Pickerel, Pike, Whitefish, Trout.
 - D. Trout, Grayling, Pickerel, Pike.

12. Native houses in Northern Saskatchewan have been built together in villages. They are arranged:

- A. on either side of narrow streets.
- B. in rows along the lake shore.
- C. facing south to get more sunlight.
- D. scattered about near a lake.

13. The Precambrian Shield can be described as a land of:

- A. much water, many trees, and fertile soil.
- B. lakes, rivers, muskeg, rock, sand, and trees.
- C. lakes, rivers, swamps, rock, and farmland.
- D. rocky hills, many lakes, forests, and grasslands.

14. The least expensive way to move heavy materials in Northern Saskatchewan is:

- A. by bombardier.
- B. by large aircraft.
- C. by barge or large boat.
- D. by large sleighs.

15. The months of the year when most of the trapping is done are:

- A. January, February, and May.
- B. November, December, and April.
- C. March, April, and September.
- D. October, November, and March.

16. The Canso aircraft is very useful for:

- A. transporting fish and heavy materials.
- B. landing on very small lakes.
- C. carrying people to go trapping.
- D. transporting mail to remote villages.

17. The new homes that Indian and Metis people are building in some villages are:

- A. made of logs and are painted white.
- B. small three room brick structures.
- C. seven room houses made from plywood.
- D. small frame bungalows made from lumber.

18. Two things that make it difficult for Indian and Metis families to have a good living are:

- A. high prices on store goods and few employment opportunities.
- B. high prices on store goods and low fur prices.
- C. high transportation costs and long distances.
- D. high costs of fishing equipment and low fish prices.

19. In the extreme northern part of Saskatchewan the people in the villages get their water from:
- A. a well.
 - B. a water filtration plant.
 - C. a rain water reservoir.
 - D. a lake.
20. Which list of buildings would you most usually find in Northern villages?
- A. R. C. M. P., D. N. R., Mission, Store, Houses, Log cabins.
 - B. Mission, R. C. M. P., Store, Houses, Log cabins.
 - C. Mission, Store, School, Houses, Log cabins.
 - D. Store, School, D. N. R., Houses, Log cabins.
21. Fish are transported by aircraft to:
- A. take them speedily to a packing plant in summer.
 - B. take them away so that the fishermen can catch more.
 - C. take them short distances to the fishermen's cabins.
 - D. take them quickly to the traplines for dog food.
22. Some type of hospital service is available:
- A. in only La Ronge and Ile a la Crosse.
 - B. in five of the villages in Northern Saskatchewan.
 - C. in many of the villages in Northern Saskatchewan.
 - D. in about one quarter of the villages of Northern Saskatchewan.
23. Children in Northern Saskatchewan might become ill more quickly than in the cities because:
- A. many houses have poor insulation and small stoves.
 - B. many live with poor sanitary facilities and on poor diets.
 - C. the climate is cold in winter and there is much snow.
 - D. many houses are made of logs and are cold in winter.
24. There are few gardens in the villages of Northern Saskatchewan because:
- A. no one has taught the people to grow vegetables.
 - B. only a few villages have suitable soil.
 - C. it is too cold to grow vegetables.
 - D. the wild animals would destroy the gardens.

25. Communication over vast uninhabited wilderness in Northern Saskatchewan is difficult. The quickest method of communicating others is by:

- A. telephone.
- B. aircraft.
- C. helicopter.
- D. radio.

26. Animals are trapped for their furs only during certain times of the year. The main month for trapping muskrat is:

- A. March.
- B. December.
- C. April.
- D. November.

27. Moccasins decorated with porcupine quills are not seen very often any more. The reason for this is that:

- A. it is becoming a forgotten art among Indians.
- B. porcupines have become scarce in Northern Saskatchewan.
- C. it is difficult to catch a porcupine.
- D. it is dangerous to work with porcupine quills.

28. Special work must be done on a moosehide before it can be used as leather. To prepare a moosehide:

- A. the men soak it in salt water.
- B. the men use sharp knives to scrape it.
- C. it is dried in the sun for one week.
- D. the women stretch the hide and scrape it.

29. Before the government built schools in Northern Saskatchewan, some native people learned to write from:

- A. H.B.C. store men who brought books along with them.
- B. travelling libraries that came to the villages.
- C. missionaries who learned the Indian language.
- D. teachers moving from village to village.

30. The Chipewyan in the extreme northeast corner of Saskatchewan are different because:

- A. they lead a nomadic life following the caribou and trapping.
- B. they speak a strange dialect and live in tents.
- C. they do very little fishing in the nearby lakes.
- D. they can bear the cold weather better than others.

31. The average Indian and Metis house in Northern Saskatchewan has:

- A. one room.
- B. four rooms.
- C. two rooms.
- D. three rooms.

32. Winter trapping usually does not continue past the end of January because:

- A. the weather is too cold to visit the trapline.
- B. the animal fur is of a poorer quality.
- C. the snow is too deep to set traps.
- D. the animals hibernate and cannot be found.

33. The yearly trapping incomes of over half of the Indians and Metis of Northern Saskatchewan are:

- A. between \$500 and \$1,000.
- B. more than \$1,500.
- C. between \$1,000 and \$1,500.
- D. less than \$500.

34. Indian and Metis men who do not fish during the summer may obtain employment:

- A. fighting forest fires.
- B. building log houses.
- C. cutting wood for winter.
- D. selling fish to tourists.

35. The languages in common use among the Indians and Metis of Northern Saskatchewan are:

- A. Cree and Blackfoot.
- B. Chipewyan and Cree.
- C. Iroquois and Chipewyan.
- D. Cree and Coppermine.

36. Which of these ways of travel has had the greatest effect upon remote isolated villages in Northern Saskatchewan?

- A. Motor toboggan.
- B. Powered canoe.
- C. Aeroplane.
- D. Bombardier.

37. The Indian and Metis population of the villages of Northern Saskatchewan is about:

- A. 18,000.
- B. 15,000.
- C. 10,000.
- D. 20,000.

38. The rapid growth in the Indian and Metis population of Northern Saskatchewan is best explained by:

- A. the people are living longer and are healthier.
- B. fewer babies die when young than before.
- C. there are many people under the age of 15.
- D. there are large families and fewer children die.

39. Indian and Metis families began a new way of life when they:

- A. began to live along the shores of lakes.
- B. began to build plywood houses.
- C. began to live in settlements.
- D. began to use new ways of travelling.

40. The occupation that the majority of Indian and Metis people of Northern Saskatchewan depend upon for a living is:

- A. fishing.
- B. mining.
- C. lumbering.
- D. trapping.

41. Living in villages has several disadvantages for the Indian and Metis families. Which disadvantage is least important?

- A. The supply of fish and game near the village becomes scarce.
- B. The men must make long trips to their trapping grounds.
- C. The men must go a longer distance to get firewood.
- D. The villages provide very little employment for the men.

42. Why do many of the Indians and Metis have very low incomes?

- A. They do not wish to get employment.
- B. There are too many people and not enough jobs.
- C. They must travel long distances to their traplines.
- D. They do not have much education.

43. Why is mink ranching well-suited to Northern Saskatchewan?

- A. The climate is cold in winter time.
- B. The number of wild animals is getting less in some areas.
- C. There is a supply of fish for mink food.
- D. Furs can be sold to many other countries.

44. Why does one find the land in northern Saskatchewan similar to that of Northern Ontario?

- A. The Cordilleran Range covers both regions.
- B. The Appalachian Mountains run through both regions.
- C. The Rocky Mountains reach into both regions.
- D. The Precambrian Shield covers both regions.

45. Not all of the Indians and Metis people live in the same way. There are differences because:

- A. some places have better opportunities for employment.
- B. some places have different geographical features.
- C. the stores in some places do not sell many goods.
- D. there are different Indian tribes living in the North.

46. In the far north the best time of year to move heavy loads long distances is:

- A. in spring.
- B. in summer.
- C. in autumn.
- D. in winter.

47. Which is the most important way in which trapping is changing?

- A. Some trappers travel to their traplines by aircraft or by motor toboggan.
- B. Stronger and better traps are being sold in the stores.
- C. Trappers build small cabins out where they trap.
- D. Better ways of preparing fur pelts have been discovered.

48. Why do trappers earn more in some fur blocks in the North?

- A. There are more fur-bearing animals in these fur blocks.
- B. It is easier to catch the animals in these fur blocks.
- C. There are fewer trappers in these fur blocks.
- D. These fur blocks cover larger areas.

49.. A trapper can earn more when his wife travels out to the trapline with him because:

- A. she does the cooking for him.
- B. she prepares the fur pelts.
- C. she helps him to set more traps.
- D. she takes care of the cabin.

50. Many men who fish find it difficult to earn enough to support their families. This is so because:

- A. some lakes have only a few small fish.
- B. the government allows only a small amount of fish to be caught.
- C. the lakes are covered with ice for a large part of the year.
- D. the price for fish is low and expenses are high.

51. Which best describes the furniture that you might see in the poorer Indian and Metis homes?

- A. A table and chairs, built-in cupboards, and a sink.
- B. A rough wooden table, a bunk bed and a few wooden boxes.
- C. A few logs to be used for a table and chairs.
- D. A chrome table and chair set and a stove.

52. Boys and girls do not help as much in trapping, tanning moosehides, or making moccasins as was done thirty years ago. The main reason is:

- A. boys and girls do not know how.
- B. boys and girls are no longer needed in this work.
- C. boys and girls have more hobbies.
- D. boys and girls attend school.

END OF TEST.

GO OVER YOUR ANSWER SHEET. Be certain that you have only ONE mark for each question and that each mark is NEAT and DARK.

APPENDIX F

CORNELL CRITICAL THINKING TEST LEVEL X, PART I

CORNELL CRITICAL THINKING TEST, LEVEL X

by Robert H. Ennis and Jason Millman

EXPLORING IN NICOMA

The year is 1990. It is the middle of June. Imagine yourself to be in the second group from the United States to land on the newly-discovered planet, Nicoma. Nothing has been heard from the first group, which landed on Nicoma two years earlier. Your group is going to investigate and bring a report back to earth.

In what follows you will be told about the investigation. Then you will be asked questions that call for clear thinking. Answer these questions as if the facts given were true.

Do not guess wildly at these questions. If you have no idea what the answer is, omit the question. If you have a good idea, even though you are not positive, answer the question.

Wait for your teacher to tell you to begin.

PART 1-SECTION A--What Happened to the First Group?

The first job of your group is to find out what happened to the first group of 15 explorers. Your group has landed on Nicoma and has just discovered the metal huts put up by the first group. The huts appear to be in good condition from the outside. It is a warm day and the sun is shining. The trees, rocks, grass, and birds make this part of Nicoma appear about like parts of central United States.

You and the health officer are the first to arrive at the group of huts. You call out, but get no answer.

The health officer suggests, "Maybe they're all dead." You investigate.

Below are listed a number of facts which you learn. For each fact you must decide if it would be evidence for, or evidence against, the health officer's idea that they are all dead. However, the fact might not be either.

For each fact, mark one of the following on your answer sheet:

A. This fact is evidence in support of the health officer's idea that they are all dead.

B. This fact is evidence against the health officer's idea that they are all dead.

C. Neither. Discovery of this fact makes no difference.

Here is a sample:

1. You go into the first hut. Everything is covered by a thick layer of dust.

This fact is evidence in support of the health officer's idea. It certainly is not enough to prove his idea, but is evidence for it. Using the special pencil, blacken the space under A for number 1 on your answer sheet--like this:

	A	B	C
1.	☒	☐	☐

Here is another example:

2. Other members of your group discover the first group's rocket ship nearby. What do you say about that fact? Mark your answer by number 2 on your answer sheet. Do it now.

You should have marked C. This fact about the rocket ship does not help us decide whether the members of the first group are dead. If you did not mark C, erase your mark thoroughly and mark C.

GO ON TO THE NEXT PAGE.

Here is a list of facts. For each one mark A, B, or C. If you have no idea which to mark, leave that one blank and go on to the next one. Consider the bearing of each fact at the time that it becomes known. Do so in the order in which they are numbered. Work slowly and carefully, and do not return to an item once you have left it.

REMINDER: mark as follows:

A. This fact is evidence in support of the health officer's idea that they are all dead.

B. This fact is evidence against the health officer's idea that they are all dead.

C. Neither.

3. There are ten huts. You go into the second hut and again find that everything is covered by a thick layer of dust.

4. You go into the third hut. There is no dust on the cookstove.

5. You find a can opener by the cookstove in the third hut.

6. In the third hut you find a daily record of the activities of a member of the first group. It is written by a man named John Stilltron. The date of the last entry, July 2, 1988, is one month after the arrival of the first group.

7. You find that the two beds in the third hut are covered with a thick layer of dust.

8. You read the first entry in Stilltron's record: "June 2, 1988. We arrived today after a tiring trip. We put up the huts near our landing place."

9. You read the second entry in Stilltron's record: "June 3, 1988. There is a plentiful supply of food. Ducks, squirrels, and deer are here and are easily caught."

10. You read the third entry in Stilltron's record: "June 4, 1988. The water in the nearby stream has been tested by our health official. He has declared it safe to drink. We are not drinking it yet. We're going to try it with some guinea pigs we brought from the earth."

11. You read the last entry in the book: "July 2, 1988. I am getting weaker and can't hold out much longer."

12. In different handwriting below the last entry, you read, "John Stilltron died the same day."

13. The health officer has now looked in each of the ten huts. He reports that there is a thick layer of dust in each of them.

GO ON TO THE NEXT PAGE.

REMINDER: A. This fact is evidence in support of the health officer's idea that they are all dead.

B. This fact is evidence against the health officer's idea that they are all dead.

C. Neither.

14. You proceed to examine the beds in each of the first three huts. You find that in each case the blankets and sheets are stripped from the beds and folded neatly in the closets.

15. The health officer reports that the beds in all the other huts are in the same condition. The blankets and sheets are neatly folded in the closets.

16. You notice a mound of earth behind Stilltron's hut. You examine it and find a stone with this inscription: "John Stilltron, July 2, 1988. He died as he lived--with honor."

17. The truck possessed by the first group is missing.

18. You investigate in the tenth hut and find a note dated March 15, 1990: If anyone should come looking for us, we have all gone exploring in the truck. We plan to head in the direction of the sunrise. (Signed) Captain Sardus, Leader of the Nicoma Explorers.

19. You see a note added at the bottom: P.S. We plan to be back within a week.

20. Eight members of your group get in one of your group's trucks and head in the direction of the sunrise. You follow a rough broad valley for 20 miles and find the first group's truck apparently abandoned by a stream.

21. You discover a note in the driver's seat: Engine breakdown. We plan to hike downstream. Perhaps there's a large body of water in that direction. (Signed) Captain Sardus.

22. One of the eight, who is a mechanic, examines the abandoned truck's engine. He declares that it is in bad condition.

23. You observe that the truck's front tires are flat.

24. You start to drive downstream, since the land is level and clear. After 10 miles of driving, you see smoke rising in the distance. So far as you know, there are no volcanoes on Nicoma.

25. You soon come to a cliff too sharp for the truck. So all eight of you get out and walk toward the smoke.

GO ON TO THE NEXT PAGE.

PART 1, SECTION B-- Examining the Village on Nicoma.

It grows dark so you camp overnight. You set out again in the morning. After walking for an hour, your party comes upon an empty village of stone huts. The sun is shining brightly. Various pieces of information are presented to you, since you are the leader of the party.

In what follows, you will be given pieces of information, two at a time. You must decide which, if either, is more reliable. For each pair mark as follows:

- A. The first is more reliable.
- B. The second is more reliable.
- C. They are equally reliable or unreliable.

Here is an example: (The information is underlined in each case.)

26. A. The auto mechanic investigates the stream by the village and reports, "The water is not safe to drink."

B. The health officer says, "We can't tell yet if the water is safe to drink."

C. Equally reliable or unreliable.

What answer did you mark? You should have marked B. The underlined material in B is more dependable than the underlined material in A. Here are some more pairs. Consider each pair in order at the time the information is offered.

27. A. The mechanic says, "The water looks clear."

B. The health officer, after making tests, says, "The water is good to drink."

C. Equally reliable or unreliable.

28. A. The health officer says, "This water is safe to drink."

B. Several other men are soldiers. One of them says, "This water supply is not safe."

C. Equally reliable or unreliable.

29. A. One soldier looks at some smoke rising. The smoke appears to him to be just behind the largest stone hut, which is on a hill about 100 yards away. He concludes, "The source of that smoke must be about 100 yards away."

B. Another soldier, who has just been behind the largest hut, says, "Oh no, the source is much farther than that."

C. Equally reliable or unreliable.

30. A. The mechanic has made a quick round of the stone huts and heard a noise in the nearest hut. "There must be someone in that hut," he reports.

B. The health officer, who was in the nearest hut for several minutes reports, "Nobody is in that hut."

C. Equally reliable or unreliable.

REMINDER: Mark as follows:

- A. The first is more reliable.
- B. The second is more reliable.
- C. Equally reliable or unreliable.

31. A. The health officer concludes on the basis of his examination of the nearest hut, "The first group of explorers probably built that hut."

B. The anthropologist (a specialist in the study of races, tribes, and civilizations) also examined the nearest stone hut. He states, "The first group probably did not build the hut."

C. Equally reliable or unreliable.

You take your group to the top of the hill behind the largest stone hut to investigate the smoke. In the distance you see a group of about 40 figures gathered around a smoky fire.

Your captain has offered a bonus of \$100 to the person who first sees any one of the missing explorers. You would each like the honor of being the first to see them--if they are there. But at the same time you are careful, because these figures around the fire may be dangerous. There are several pairs of field glasses in the group. The sun is shining brightly. With field glasses one can count the logs on the fire.

32. A. The mechanic, looking through his field glasses, says, "They are tan-skinned creatures with furry spots."

B. The anthropologist, looking through his field glasses, says, "They don't have furry spots. They are wearing skins of animals."

C. Equally reliable or unreliable.

33. A. The mechanic says, "I think there are 40 of them."

B. The anthropologist says, "No, I think there are only 37."

C. Equally reliable or unreliable.

34. A. The anthropologist exclaims, "That's Captain Sardus there on the left by himself."

B. The mechanic reports, "That's Sergeant Edema who just stood up on the right."

C. Equally reliable or unreliable.

35. A. You borrow the anthropologist's glasses and say, "Yes, that's Sergeant Edema."

B. At the same time, the health officer, who has borrowed the mechanic's glasses, says, "Yes, that's Sergeant Edema!"

C. Equally reliable or unreliable.

Now the question is whether the man on the left is Captain Sardus. If so, then the reward goes to the anthropologist. If not, it goes to the mechanic.

36. A. The health officer then looks through his field glasses at the one on the left. "That's not Captain Sardus," he says.

B. The anthropologist, who has his glasses again, replies, "Yes, it is."

C. Equally reliable or unreliable.

GO ON TO THE NEXT PAGE.

REMINDER: Mark as follows:

- A. The first is more reliable.
- B. The second is more reliable.
- C. Equally reliable or unreliable.

37. A. The health officer says, "That new one is not one of the fourteen explorers."

- B. The anthropologist agrees, "You're right, he's not."
- C. Equally reliable or unreliable.

38. A. The anthropologist continues, "And look! ~~There's~~ Captain Sardus facing our way with his hand over his eyes. That's the same person as the one I called Captain Sardus before. I've been following him."

- B. The health officer says, "Yes, that's Captain Sardus facing us now. But he's not the one who was over there on the left. That one is sitting down with his back to us. I've been following him, too."
- C. Equally reliable or unreliable.

You ask them to see if they can agree on the number of beings in the group so that you can give an accurate report.

39. A. The health officer has had practice counting large numbers of objects on microscope slides. He announces, "There are exactly 39 figures in the group."

- B. One soldier says, "No, there are 38."
- C. Equally reliable or unreliable.

40. A. The mechanic takes his glasses back from the health officer and makes a count. "Yes, there are 39 of them." he says.

- B. The soldier repeats, "There are only 38."
- C. Equally reliable or unreliable.

The people around the fire get up and start toward the village. You quickly take your small party to a place on a nearby hill. There you can see the village without being seen. You want to find out whether this is a friendly village, whether the explorers are prisoners, and how many explorers are left.

The mechanic writes down what people say they see.

41. A. One soldier counts the people as they move around in the village and announces, "Only 32 came back from the fire."

- B. Another soldier says, "You must have missed two. I counted as they filed past the big hut. 34 came back. None of them came back any other way, I believe."
- C. Equally reliable or unreliable.

42. A. The anthropologist reports, "One of them had on a green hat when they returned from the fire. But he's the only one. I watched them carefully as they went by the big hut.

- B. The health officer says, "I think there are two with green hats. First I saw one on the left. Later I saw one way over on the right."
- C. Equally reliable or unreliable.

GO ON TO THE NEXT PAGE.

REMINDER: Mark as follows:

- A. The first is more reliable.
- B. The second is more reliable.
- C. Equally reliable or unreliable.

43. A. A soldier says, "Five times in the last minute the one in the green hat has talked to someone and pointed. Immediately that person has run off in the direction he pointed."

- B. "He must be the leader," added the soldier.
- C. Equally reliable or unreliable.

44. A. "Look, Captain Sardus and two other explorers are coming up to the one in the green hat, who is pointing to the big hut. The one in the green hut is ordering them to go in."

B. "Here come Sergeant Edema and one other explorer. The one in the green hat is pointing to the big hut. They're going in also," added the anthropologist.

- C. Equally reliable or unreliable.

45. A. Several more groups of explorers enter the hut. The health officer asks the mechanic, who has been keeping a record, "How many do you think are in there now? I've told you each time one went in. I think there are 13."

- B. The mechanic replies, "According to my record, there are 14."
- C. Equally reliable or unreliable.

46. A. The anthropologist states, "That one with the green hat is going into the hut to the right of the big hut. Three others are following him in."

B. The health officer says, "Look, here comes another with a green hat. So the one in there is not the leader, since there are two. Let's check the people who go into that hut."

- C. Equally reliable or unreliable.

47. A. The anthropologist has been describing the people as they go in, trying to get some idea of what they might be like. He states, "18 people went into that hut."

B. The mechanic disagrees, "According to the record of what you have said, only 17 went in."

- C. Equally reliable or unreliable.

48. A. The anthropologist then looks over to the large hut and says, "Do you see those two men? Perhaps they are sentries guarding the explorers. Oh, look! They're changing. The walking one stops about 15 feet from the door and then the one standing by the door walks over to him."

B. The health officer says, "Yes, I've watched them make ten changes now. But you have the order wrong. The man by the door leaves his post before the walking one reaches the point of change."

- C. Equally reliable or unreliable.

49. A. The mechanic, who also has been watching, says, "I think the health officer is right."

- B. The anthropologist says, "I think he's wrong."
- C. Equally reliable or unreliable.

GO ON TO THE NEXT PAGE.

REMINDER: Mark as follows:

- A. The first is more reliable.
- B. The second is more reliable.
- C. Equally reliable or unreliable.

50. A. One soldier says, "Oh, look at the tall sentry. He has an odd way of walking. He brings his left hand across almost to his right shoulder before his left foot touches the ground."

B. Another soldier replies, "It is odd. I've been watching him for about five minutes, though; and you have the order reversed. He brings his left hand across after his left foot touches the ground."

C. Equally reliable or unreliable.

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